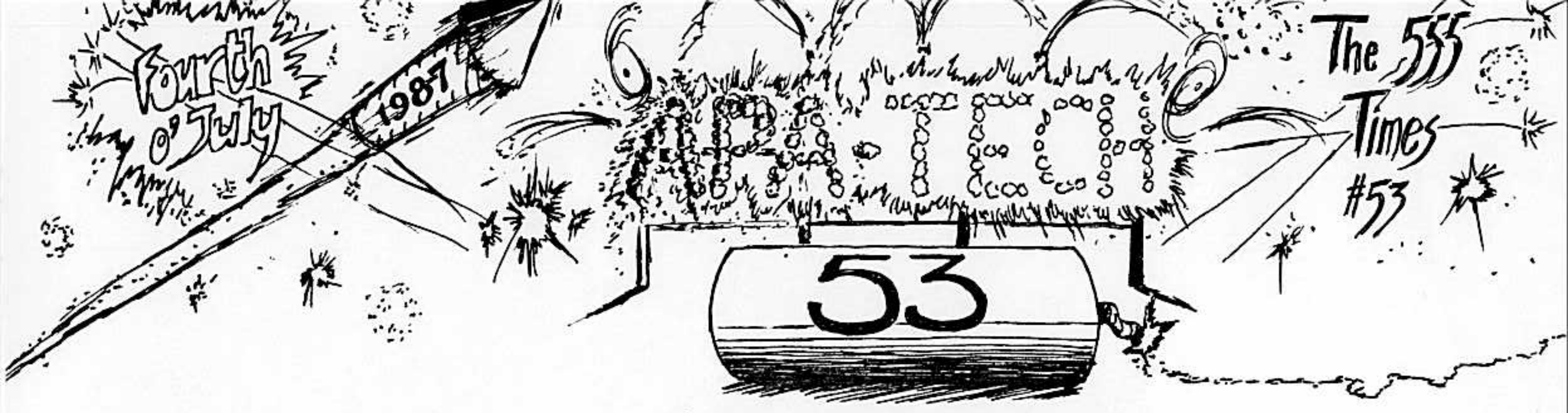
ApaTech



The Amateur Press Association by and for
the members of General Technics
and other

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Table of Contents

COVER*/ Annette Kavanaugh 1
THE 555 TIMES #53 / Shalmaneser 1
TRANSPORTER TOPICS [#47] / Rod Smith 3
CRUMBCRUNCHERS, INC. / Dave Powell and Susannah West 2
BE LIKE TWO FRIED EGGS / Greg Ruffa 12
MAILING COMMENTS AS FAR AS THE EYE CAN SEE (ALMOST) / Donna and Tullio Proni 3
FRACTAL REALITIES #.012018309 / Hugh Daniel 3
AN UNSUPPRESSED TRANSIENT / Andy Anda 3
PARENTHETICAL PERAMBULATIONS / Annette Kavanaugh 9
[General Dynamics Convair and Space Systems Divisions] WEEKLY LOG / franked by Greg Ruffa
FRACTAL POSTCARD / selected at random and franked by Greg Ruffa

page count: 37

* I won't give away the cover title: you can probably figure it out. If you can't, you probably shouldn't be thinking about stuff like that anyway...
Shal.

Minac is two pages every four months; the copy count is thirty (30).

No one was dropped this time, since I forgot who was on the edge; several of you need to get a 'zine in next month. The deadline is Saturday, 1 August 1987 in Kalamazoo. Remember that **AT55** will be collated in Phoenix.

Many of your accounts are under a $2.- balance. Please send money to GTB as necessary.
Your account before postage stands at: $13.91

Whoo! Sound like they're blowin' up Oakland already and it's only 2 PM. I'm going out to see the fun. See ya.
Shal.

TRANSPORTER
TOPICS

Rodford E. Smith
730 Cline St.
Frankfort, KY 40601
(502) 227-7741

Number 46

TV

I enjoy watching Our World but have trouble remembering when it is on. For some reason I don't recognize the title in the TV listings, perhaps because the title looks like that of a soap opera.

Place Names

More strange road names: Howdy-Doody Drive, Boomerang Road, Anonymous Road, The Chicken Road, Oriole Haul Road.

More strange place names: Twila, Alva, Molus, Frakes, Science Hill, Dog Walk, Texas, Black Gnat, Bee Spring, Meshack, Dimple, Wesca, Wysox, Nineteen, Equality, Do Stop, Gullett, Ova, Peedee, Pond River, Tress Shop, Neosho, Nebo, Pee Vee Fies, Browder.

MAILING COMMENTS

Chair: I am trying to send this early. We'll see if it gets there in time. *

Generic Engineer: Welcome to the APA and welcome to the club. It is often hard to find something to say. Thank Ghu for mailing comments! * I would like to be my own boss, someday, as a full time writer. * Your "interociter" story is interesting. The thing sound a bit like a planetarium projector, only you stand outside instead of sit inside. * That bit about older being better is something I have encountered a few times. It usually isn't a matter of technology but workmanship/effort. Too many manufacturers go for easier instead of better. * I have heard a report (probably apocryphal) that during a test of the Phalanx system the unit was supposed to shoot at a towed target. Before it could be turned off it shot down the tow plane, shot the target, then shot the pilot as he ejected. *

Philosophical Song: (That is one of my favorite pieces of music, by the way, Roxanne.) Congratulations on your new life. I hope it continues to be so easy, at least for a while. (Wouldn't want you to get bored!) * People always recognize me. I've looked like this for half my life. Just lucky, I guess. * On the other hand, my parents taught me to read before I started grade school and I continued to keep ahead of the other kids. This did little

to make me popular. *

Uncle Bear: Keep 'em flying. * Did you hear that Voyager missed the Paris Air Show this year because some nitwit bureaucrat blocked the paperwork at the last minute? *

Amorphous Guy: Thank you for the explanation. * Re. Yr. Cmnt. Valli: Tropical islands don't have the resources for a high-tech society. Not enough heavy metals. *

Crumbcrunchers: Maybe you could hand the paper cutter on the wall until you need. On second thought, Marlene might pull it down on top of herself. * More than one magazine has been ruined by success. * And who knows how many cases of depression are actually caused by something in the diet? * My niece also loves to swing. Must be in the genes. *

Megawhats?: Having on Dave's guided powerplant tour I feel qualified to offer my sympathies. (Just kidding, Dave!) Wait 'till we get fusion! * Then come to Concave. Kentucky is not a southern state. * If you need any more info on "The Book Exchange" let me know. *

Franked Material: Who belongs to this? Identify yourself! *

Scott: I only caught part of one episode of Max Headroom but found it interesting. I have heard the NPR article on him, which goes into his origin. * It is amazing just how technically demanding even the most mundane-sounding job can be. Have you thought of microwave plastic welding? * Because the fake bomb defusers don't run around pointing gun-like objects at non-combatants. *

Projection Booth: An interesting point about old films is that the B&W movies don't fade with time and use the way those made in color do. Today, some of the early color movies look almost as bad as the colorized B&W films. * What was all that about Horse Cave, Ky. in your franking? *

Upward Mobility: Hmmmm, maybe the dream of so many fans, that of owning their own research company, will come true in a way. * Okay, now what is a Star Sculpture? * I made the mistake of letting my Traveller players find my D&D world. The result was that when we got back to playing D&D you had a bunch of fighters and wizards running around with fusion weapons. Ack! *

Incorrect Thoughts: Armies have always been maintained for political reasons, either you own or your enemy's. * Reactions I can live with. Its the lynchings I worry about. *

Rolf: I hate the idea of buying a new car, but it will have to be done within the next year or two. * I have hears people describe their car as "smokin'" or "hot" but your experience is ridiculous. * Would someone please explain exactly how a Thunderscanner works? *

Ouch

I have a knot in each palm from a time when I hammered on something with my right hand. When it started hurting, like an idiot I used my left hand! Now, I have a matching pair of

neuromas, the one on the right larger and more painful. These are caused by impact damage to a nerve, which make it swell. They are usually seen in the feet of joggers and runners. Lately, the worst one has been periodically swelling and hurting, and causing partial numbness in my two small fingers. Short of risky surgery there is nothing I can do, short of take aspirin and soak my hand in hot water. I learned about the last bit, by the way, from washing dishes. This isn't serious, but be warned about hitting things with your palm. It could cause damage which will last for years.

Japanimation

I recently got a copy of "Project A-Ko" and love it. Yes, it is rather bizarre, especially with the Japanese attitude that homosexual relationships are a safe way for teenagers to experiment (or at least that is the way it was explained to me). It is funny and fun. I plan to get some friends hooked on it.

Once again, ugly whitespace. We must find a cure!

Rod

Crumbcrunchers, Inc.
P.O. Box 98
Ripley, OH 45167
513-392-4549

June 16, 1987

I imagine many of you experienced the earthquake on June 10. I was sitting on the lawn in the back yard of the Ripley Museum, attending a meeting of the July 4 planning committee. Somebody mentioned that the step they were sitting on was moving, and we soon noticed that the ground was shaking gently. Though some tried to dismiss is ("Oh, it's just a truck" or "It must be a barge on the river") it was pretty obvious to me that it was an earthquake. - a suspicion that was confirmed when we watched the 11 o'clock news.

Oddly, this is the first earthquake that I've actually been aware of - I usually seem to be asleep when they occur. Or as in the case of the 1980 quake, down in the cellar of a building. Are we headed for another BIG one? (As in the 1811 quake.)

Ripley's birthday slogan - "Ripley's Alive at 175" - now graces banners that hang above the stoplights at either end of town. These banners are courtesy of Pepsi, one of their final contributions to the village, as the bottling plant will be closing down in September. (The plant closing is something of a blow, as a lot of Ripleyites are employed there, and the decision to close was rather sudden. Apparently Pepsi has decided to move away from bottling in glass bottles to exclusively plastic and cans. The plant here, of course, is set up only for glass bottles. Ripley will remain a sales distribution point.)

I have volunteered or been volunteered for the job of making posters, and writing press releases and PSAs. I was somewhat chagrined to be told, after I'd completed three posters, that I couldn't mention the fireworks. What's the Fourth without fireworks?! Unfortunately, liability insurance is too prohibitively expensive for the American Legion, which is sponsoring the fireworks. They're putting them on anyway, of course, but the attitude seems to be the less said about them, the better. (Outside the village, that is - the Legion is actively advertising and soliciting donations in the village, with notices in the paper and donation cans in all the stores.)

We still don't have many cicadas (I haven't seen a one in downtown Ripley, although I have read in the school news - published in the paper each week - that the kindergartners had been "sharing cicadas"). Cincinnati is still plagued by them, though the noise has slackened off considerably in the last few weeks. Determined to find humor in these insects, Cincinnati radio stations have been airing mock ads for "cicada pizza." WEBN has had a T-shirt made up, featuring its mascot (a dragon) with the words, "Eat 'em and smile - Cicada '87."

Yes, communities around here do have interesting names. Kiran mentioned Felicity and Utopia; there are also many communities with Biblical names - Bethel and Chilo (pronounced Shiloh) and Mt. Orab. The town I like best is not actually in this area, but half-way between Ripley and Columbus - Washington Court House (usually referred to in writing as Washington C.H.). And yes, it does have a rather interesting and quite prominent courthouse.

We're frantically STARWINDing these days, with a September publication date in mind. I'm REALLY pleased with the lineup for this issue, and here it is (please note that we're featuring one of our own!)

"Who Walks in Moonlight" by Barb Myers - a rain forest dweller meets one of his gods - or does he? (fiction)

"The Other Fellow's Woman" by Allen Byerlee - a fantasy set in 1990s Zaire. (fiction)

"Again - the Heart of Darkness?" by Allen Byerlee - what's in store for today's Africa? (nonfiction)

"From Explorer to Apollo" - by James Dorr - a history of U.S. space exploration. (nonfiction)

"The Urban Eyeball" - by Greg Ruffa - astronomy for the city star-gazer. (nonfiction)

"Cellarman" - by Kurt Hyatt- an exterminator discovers some very unusual and dangerous pests. (fiction)

"Reunion" by Richard King - an astronaut returns to earth after a twenty-year absence. (fiction)

"The Crazy Loves of Ray Bradbury" by Sandra Puccio - profile.

"Who Will Watch the Guardians?" by Doug Beason - a possible future for SDI.(fiction)

"Nuclear Winter - a Doomsday Machine?" by Jane Orient - how realistic is the nuclear winter scenario? (nonfiction)

And to further pique your interest, here's a cartoon by the artist who's illustrated "Cellarman"!

VERY WELL, MANAGEMENT WILL ACCEDE TO YOUR DEMANDS FOR GREATER NITROGEN AND POTASH
BUT THE GROW-LIGHTS ARE DEFINITELY OUT!
PEATMOSS REMAINS NEGOTIABLE
TOMASIC '83

No time for mailing comments - maybe next month! Susannah

BE LIKE TWO FRIED EGGS

Gregory Ruffa
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* * *

Summer came in right on cue this time. We'd be having some pretty indifferent weather in June, with a lot of cool, overcast days, sometimes clearing in time for sunset and often not bothering to admit sunshine at all. As soon as we got to June 22nd, though, the clouds have scarcely offered much of a showing, except for the La Jolla Fog at eventide, which we're only really rid of in the hottest months.

The advent of the season has brought good news along with the improved weather. Space Systems Division may just survive after all. The chiefs have now committed us to building eighteen Atlas/Centaur Block IIs (plus one spare), which we are currently out trying to sell. Since the Gummint agreed to let us arrange our own launch services, we no longer have to build rockets as NASA or the Air Force gets around to asking us. We have already been chosen by Eutelsat for three launches, although there is pressure in Europe to go on Ariane. We're supposed to hear from NOAA in September as to whether we will launch their next series of GOES spacecraft. We will likely be launching the Combined Release/Radiation Experiment Satellite; this is a spacecraft being built by Ball Aerospace for NASA and the Air Force, which will release canisters of barium and lithium into the upper atmosphere for scientific studies and will monitor the radiation field in the Van Allen belts for calibration of Air Force models of that region (Hmm -- now why would they want to know about that?).

Not wanting to gloat over other people's misfortune, but... The Medium Launch Vehicle program that was awarded to McDonnell Douglas, so they could launch Navstar satellites on Delta-IIs, is in serious trouble. The next series of spacecraft are rather heavier than the first batch that are going up. "MacDAC" won the entire set based on a mission plan following a northeasterly launch from Cape Canaveral; this causes the vehicle to fly over central Europe and Asia Minor on the way to orbit. Since the **Challenger** disaster, range safety requirements have become extremely stringent: this particular path, which was rarely used, is now absolutely forbidden. The Delta-II is not powerful enough to get those Navstars up any other way. With the manifest for the Shuttle getting shoved ever further into the future, the Air Force is now back talking to us. And we **just** happen to have some Atlas/Centaurs available in 1990... This could be quite a few missions for us right there.

We got awarded a contract to start on a working design for the Advanced Launch System around July 10th. (This wasn't really much of a trick: one version of the story that I heard said that the Air Force wound up giving money to all seven of the serious contractors...) I don't know how much Flight Mechanics is going to be involved with this. It seems likely that I will be spending a lot of my time in the next few months either on this or analyses for prospective Atlas/Centaur missions.

I am also continuing to work my way through the half-filing-cabinet on radioisotope thermoelectric generators (RTGs). I am supposed to be going to a seminar on hazard analysis for missions using these thingies at NASA Lewis Research Center in Cleveland sometime this month. I don't actually expect to be home much this month. I'm about to leave for Oakland and Westercon (where this is being collated) from the 2nd to the 6th. I am going on a tour of Palomar Observatory on the 11th. Between the 18th and the 22nd, I will be in Boulder for the Case for Mars III Conference; one of the surprised attendees will be Bill Higgins, who decided to come almost at the last minute (he is easily drawn to the lure of a high density of bookstores). Somewhere in here, I'm also supposed to go on that business trip. I just came from the AIAA/ASME/blah blah blah Joint Propulsion Conference right down the street at the Convention Center (site of the 1986 Westercon). I started working on my boss back in April and a bunch of us got sent out in drips and drabs to various sessions. I went to most of the lunatic stuff: Future Flight Systems and Propulsion for Manned Mars Missions; there was lots of stuff about inertially-contained fusion drives and antimatter propulsion (enough to make you think we can really do these things...), as well as less exotic stuff like nuclear-electric vehicles. Maybe I'll dwell on this later, when I'm not getting ready to leave town.

Mostly because my boss didn't think he'd have the time, I will be doing some things down at San Diego State University this autumn. I will be giving a talk on something or other I think I can snow them with at the student chapter of AIAA. I will also be teaching the second-semester course on flight mechanics; it looks like I'll already be cancelling the second night, as I'll be in Phoenix for Cactuscon. I hope to have some reasonable amount of time to do this -- I've already unloaded the job of Publications Chairman for the local AIAA chapter and will be doing the newsletter jointly with him.

I have also set some machinery in motion for moving on. I have letters off to Science Applications International in Schaumburg, Illinois and to Ball Aerospace in Boulder. I've an eye out for other possibilities with the aim of changing jobs or going back to school in January.

* * *

I'm going to take part of the next two issues to answer some questions that came up a while ago. I'll get to nuclear power sources next time. I wanted to say something about the use of ozone and fluorine as oxidizers for rocket propulsion, which is to say, something about why we don't use them. Ozone (O_3) can be liquified, but, since it does have a higher energy content than the more common oxygen molecule (O_2), the liquid phase is explosive. Ozone is kind of a problem to handle, anyhow, since the molecule readily decomposes under ultraviolet light, so it would pretty much have to be processed in darkness. Fluorine (F_2) is a bit too excellent an oxidizer: it is the most electronegative element, i.e., its atoms are extremely greedy for electrons. The element and its most likely combustion product, hydrogen fluoride (HF), are highly corrosive and will eat practically everything typically used in rocket and launch pad construction. I understand GD really did do some experiments with fluorine some time ago and decided it was just far too difficult to work with. Instead, engine manufacturers such as Pratt-Whitney (who build the engines for Centaur) are working to increase the combustion chamber pressures and the expansion ratio of the engine nozzles to raise the specific impulse (which is related to exhaust velocity) from about 430 in the 1960s to the present 448 and on to perhaps 485 seconds by 2000. For a given mass of hydrogen fuel and oxygen, this is roughly equivalent to increasing the payload capability about fifteen to twenty percent.

* * *

I'll be suspending most of my frankings henceforth, though I will include news on conferences or other items of interest. I still have some catching up to do: I'll have to get to mailing comments on AT #52 later. See you next month.

MAILING COMMENTS

APA-TECH 51

Rolf "Doctored Truth," eh? Well, I laughed (or groaned, actually), but I must admit that, if I didn't keep some track of what's on television, I wouldn't have gotten it at all.

An acre is 1/640 of a square mile, which is 43,560 square feet, which decomposes into 121' x 360'. Yucko! Give me metric units (almost) every time. At least a hectare is 100 meters square...

Susannah I kind of liked the Park St. Book Store at Oxford St. in Rochester, which was a short walk from Mike and Alice's place there back in (heavens! was it really?) 1981.

I can't agree that all U.S. stamps aren't as beautiful or exciting as those of many foreign countries. (I collect commemoratives.) But it does seem to be the case that we print very few with simple or beautiful themes; most seem to depict specific events, places, or persons. (Americans like their stamps to be **about** something...) I will agree with the remarks of many non-natives I've met that our paper money is among the ugliest in the world.

My dictionary says "alright" is all right to use, although it is considered to be (at least) a corrupted spelling.

Rod I'd estimate that the spacecraft you describe weighs at least 500 kilograms; the deluxe version probably comes in at over 800. You get killed on propulsion, the electrical power system (especially the batteries), and structural elements. You want to stay under 100 kilos and have **redundancy** yet? For a probe going into orbit around Venus or Mars, roughly half of the weight at launch is propellant for putting it into orbit. Oscars and the Amateur Space Telescope can be placed into nearly their final orbit by an upper stage and so don't have to carry much propellant themselves (I'd guess that the AST weighs rather more than 100 kilograms, anyway). Bear in mind that Sputnik-1 weighed 84 kilos and that the Lunar Surveyors massed almost 300 kilograms upon arrival (their launch weight was just over 1000). The great majority of probes sent to the Moon or any of the planets weighed more than 800 kilos and more than 90% of them weighed over 300. A 100-kilo limit on an interplanetary probe really gives you very little to work with...

You and Rolf raise a valid point, which I'd overlooked. The exhaust velocity of Marty's rockets **would** have to exceed 11,260 m/sec to escape the Earth and provide any reaction momentum. That corresponds to a specific impulse of 11,260 m/sec / 9.8 m/sec^2 = 1150 seconds, which means you'd need something like ion propulsion and can't do the job with chemical rockets at all.

I've heard a lot about the dreaded California Highway Slime, but have yet to encounter any in three winters' driving. Could it be another urban myth like Albino Sewer Alligators or 50¢ Coffee?

Not so fast, Rod: the object in your story wouldn't be identified as a comet by its high albedo. Albedo is not a quantity which is measured directly -- it must be inferred from the body's size and its distance from the Sun. For example, the sizes of Pluto and Charon still are unknown because we only have a mass estimate for the two bodies (from Newton's generalization of Kepler's Third Law), but we can only guess what their densities, diameters, or albedos might be; a knowledge of one of these unknowns would tell us the others. The Earth's albedo wasn't known accurately until the 1960s because we were too **close**: our planet turned out to be a lot cloudier than most experts believed...

For the discovery of your hypothetical intruder, observers would note one of two things early on. An initial International Astronomical Union circular would note the appearance of a new object. Within a day or so, someone (likely an amateur -- more of 'em!) would add it to their observing program and have a look. Positional measurements over a couple weeks (maybe less) would reveal the incoming hyperbolic trajectory (once Brian Marsden got over his disbelief) and the later non-ballistic behavior (!). Somewhere during this time, someone would do a spectrographic study and notice that the reflected solar spectrum had all its absorption lines blue-shifted a couple Angstroms, which would drop some jaws. (Something like this happens in **The Mote in God's Eye.**) Inside a month after the first observation, a conference full of preliminary papers would be convened to discuss the find; press conferences would already have occurred. This is very much like what happened with Supernova 1987a. There would be plenty of time for all of this to happen: 150 km/sec only moves you one astronomical unit in 11½ days.

Another point we've learned is that comets don't seem to have high albedos, if Halley is typical. The nucleus turned out to be three times larger than expected because its albedo is only around 0.03. Some folks now speak of "icy dirtballs," instead of "dirty snowballs."

There is an optimal specific impulse for continuous-thrust systems, which is coupled to the vehicle and mission designs. Propellant mass goes down exponentially with increasing specific impulse (or exhaust velocity), but the mass of the power supply goes **up** linearly. For the Mars missions I looked at, the optimal solution is in the vicinity of 4000 seconds. Simply increasing acceleration, specific impulse, or power is not necessarily a good solution to the problem of ship design. The books I have are probably not in print any longer, but if you have access to a good engineering library, you may find some references on ion or continuous-thrust propulsion. Don't get discouraged from writing hard SF: you're surrounded by willing (even obtrusively so) technical consultants...

Bonnie It's kind of hard to imagine Ishercon without "weapons," but I certainly can understand your feelings. I have to say that I think it was very rude for the unnamed parties to open fire on "noncombatants."

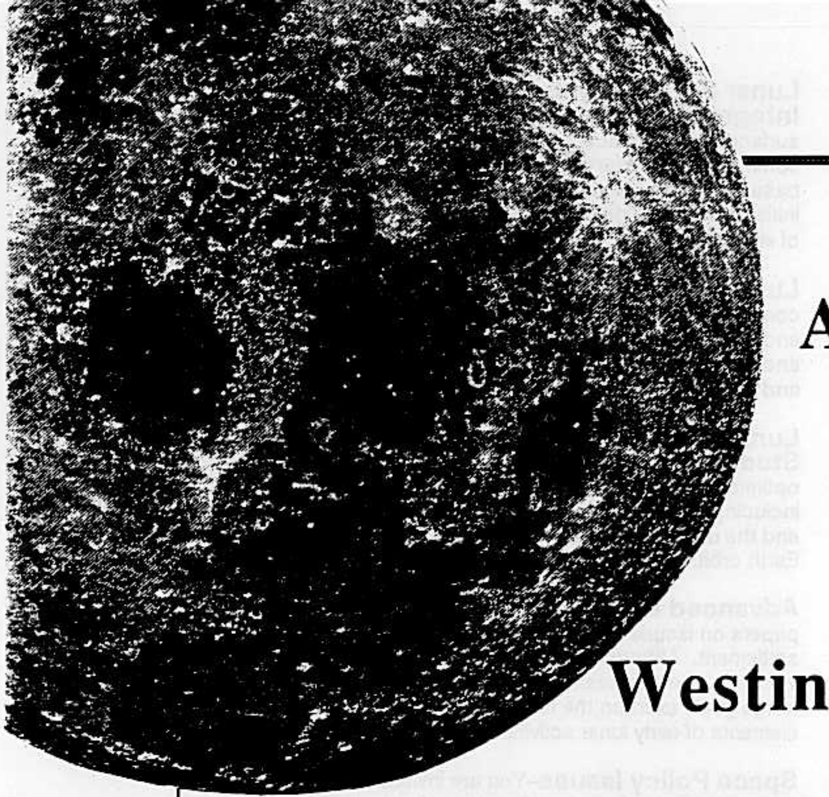
Was the Hilton Hotel in Portland, by any chance, the one which served as the "Huber Institute" in the PBS adaptation of **The Lathe of Heaven**?

Valli I will again remind everyone of my offer of Xeroxing service for around 2½¢ a copy, if rates in San Juan or Milan (or elsewhere) are exorbitant.

I had the opportunity to be a tourist in Puerto Rico a couple of times many years back. I enjoyed El Yunque, too -- perhaps more than the cities. I never got over to the western half of the island at all. Don't miss the world's largest radio telescope at Arecibo while you're there. I've no idea whether they give tours. (You can tell where **my** priorities are.) Have a good stay out there.

Superconducting Guy I'm interested in hearing any such news as you can divulge about things at work. Take care -- signing paychecks can be legally interpreted as tantamount to accepting the conditions of employment. You could probably fight that successfully, if you can afford the lawsuit.

Hmm... among all the folks in the APA, we probably have $250,000 in credit. Whaddaya think, gang, wanna buy a solar observatory? It rather floors me that the facility, a house, and ten acres (oog -- that hateful unit again) of land are going for that little; there are **condos** out here that go for that much!



April 5-7, 1988

Houston, Texas

Westin Galleria Hotel

2nd Symposium

LUNAR BASES & SPACE ACTIVITIES OF THE 21st CENTURY

ABSTRACT DEADLINE: SEPTEMBER 14, 1987

Program Chairman	**General Chairman**
Dr. Wendell W. Mendell	Dr. Aaron Cohen
Solar System Exploration Div.	Center Director
NASA Johnson Space Center	NASA Johnson Space Center
Houston, TX 77058	Houston, TX 77058

Dauphin

Call for Papers

NASA/AIAA/LPI Symposium Lunar Bases and Space Activities of the 21st Century

April 5-7, 1988
Westin Galleria Hotel
Houston, Texas

Abstract deadline: September 14, 1987

A second symposium on Lunar Bases and Space Activities of the 21st Century will be sponsored by NASA, AIAA, and the Lunar and Planetary Institute to discuss current research on the establishment of permanent bases on the Moon and related space activities that may be pursued in the early 21st century. The broad topics to be addressed are scientific experimentation at a lunar base (such as astrophysics or human adaptation to 1/6 g), space technologies (including transportation, lunar surface infrastructure, utilization of lunar materials), and political and programmatic issues (such as public and private initiatives, international cooperation, legal concerns).

The symposium General Chairman is Aaron Cohen, Director of the Lyndon B. Johnson Space Center.

The meeting will be held at the Westin Galleria Hotel in Houston. Plans are underway for a series of special social events and complementary spouse programs to enhance the symposium.

The meeting will consist of plenary sessions, in which invited speakers will discuss general areas of science, technology, and policy, and contributed paper sessions on specialized issues. Plenary session presenters will be allowed 30 minutes each, including discussion. Presenters of contributed papers will be strictly limited to 20 minutes each, including discussion.

You are invited to indicate your intent to participate by completing the "Abstract Submittal Form" enclosed or the similar form found at the back of each issue of Aerospace America. You should submit the form to Stephanie Tindell, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058. After a preliminary screening by the Technical Program Committee, most of you will be sent special format paper and instructions for submitting a 1—page summary of your paper by the deadline–September 14, 1987. This submittal should also be made to Stephanie Tindell. The camera-ready form of your 1-page summary will be published in an abstract volume to be distributed at the symposium. The two additional copies you will be asked to submit will be used by the Technical Program Chairman, Dr. Wendell W. Mendell, and his committee to determine which papers will be accepted for presentation. You will be mailed notification of acceptance by November 20, 1987.

If your paper is accepted for presentation, you will be expected to provide preprints by the first day of the symposium. Receipt of the preprints is a prerequisite for delivery of a paper. A bound proceedings volume will be edited and published after the symposium by the Lunar and Planetary Institute. You are responsible for obtaining sponsor and employer approvals to publish the full paper.

Papers are solicited in all areas of science, technology, or policy dealing with lunar base development:

Science–You are invited to submit papers dealing with lunar science, astronomy and astrophysics from a lunar base, physics and chemistry experiments enabled by aspects of the lunar environment, life science experiments (including adaptation to 1/6 g), and other scientific research enabled or enhanced by access to a capable lunar facility.

Lunar Surface Systems--Concepts and Integration–You are asked to prepare papers about surface system concepts for habitability, work areas, power, communications, surface transportation, life support for the base and extravehicular activities, and other elements of the initial and growth phases of a lunar base and about the means of emplacing them.

Lunar Resource Utilization–You are invited to contribute to sessions discussing requirements, techniques, and processes for the mining, extraction, fabrication, storage, and use of lunar resources to enhance lunar base activities and to be exported to space.

Lunar Transportation Concepts and Tradeoff Studies–You are asked to submit papers dealing with the optimization of the cislunar space transportation system, including spacecraft definition and design, trajectory analyses, and the use of and requirements for servicing facilities in low Earth orbit, lunar orbit, and other locations.

Advanced Lunar Planning–You are invited to submit papers on issues leading to self-sufficiency of the mature lunar settlement. Although topics in this session may overlap those in others, the emphasis will be on the influence that long-range goals exert on the technical, organizational, and social elements of early lunar activities.

Space Policy Issues–You are invited to contribute papers on the wide range of space policy issues, including international space law, public-private venture potential, international cooperation, and large-scale program management.

Special Sessions–Several special sessions will be convened to address specific topics of broad interest. Those currently identified include

Private-Public Cooperative Ventures in Developing a Lunar Base
Foreign Cooperation/Competition
Large-Scale Program Management for the Lunar Base

If you are interested in organizing additional special sessions, contact the Technical Program Chairman.

For additional information about the second symposium on Lunar Bases and Space Activities of the 21st Century, contact the Administrative Chairman:

Barney B. Roberts, III
Mail code ED13
NASA Johnson Space Center
Houston, TX 77058
(713)483-6605

or the Technical Program Chairman:

Dr. Wendell W. Mendell
Mail code SN3
NASA Johnson Space Center
Houston, TX 77058
(713)483-5064

Remember: Publishable **abstracts** are due **September 14, 1987**. Send them to

Stephanie Tindell
Lunar and Planetary Institute
3303 NASA Road 1
Houston, TX 77058
(713)486-2143

PAPERS OFFERED FOR CASE FOR MARS III (TENTATIVE)

TECHNICAL SESSIONS

SESSION: PRECURSOR MISSIONS

Title	Author (affiliation)
Tethered Sample Return	A. Stern (CU-LASP)
The Case For the Mars Observer	P. Clark (JPL)
Mission Concept Trade Studies from for a Mars Sample Return MRSR Mission	A. Friedlander (SAIC)
An Ion-Driven Phobos Sample Return: A Double Thrust Toward an Economical Mars Mission	A. Willoughby *et al.* (NASA-LeRC)
Mars Rover/Sample Return, Aerocapture, Entry & Landing Phase Overview	Joe Gamble (JSC)
Planetary Protection and Back Contamination	John Rummel (NASA HQ)
Mars Rover Sample Return Missions	D. Rea (JPL)

SESSION: MISSION STRATEGY

Mars Mission Planning: A Comparative Analysis	F. Sietzen (LA Natr. Sci. Ctr.)
Mars & Phobos Exploration Scenarios w/Prelim. Equipment & Student Design	W. Fowler *et al.* (U of TX)
Trip to Mars Employing Express Crew Transfer, Nuclear Engines, Aerocapture, & Standard Space Shuttles	T.Orahood (Cal Poly)
Modeling & Simulation of Advanced Space Systems	S. Nozette (Prog. Inst.)
Planning For Solar System Exploration & Colonization	J. Halligan (Aerojet)
Mission Design Tradeoffs for MMM	G. Woodcock (Boeing)
Possible Resource Synergisms Between Mars Programs & Operations and the Earth-Moon Space Activities	B. Cordell (Gen. Dyn.)
Ph-D Mission: How to Get There	F. Singer (G.M. Univ.)
Transportation Options for a Sustained Mars Base	S. Hoffman (SAIC)
Piloted Sprint Missions to Mars	J. Niehoff (SAIC)
MMM Impact on Space Station: An Overview	R. Murray *et al.* (NASA-LaRC)
The Role of the Space Station in Mars Exploration	J. Soldner (SAIC)
A Mars Mission Profile Option	A. Young (NASA-MSFC)
Mars Mission and Systems Concept	Meredith *et al.* (NASA-MSFC)
A Program Strategy for Efficient Sustained Mars Exploration	E. Strickland (Wash. U)
Mars 1999: Low-Cost, High-Return Missions to Ph-D Using Ext. Tanks	Brian O'Leary (SAIC)
Mars Mission & Program Analysis	E. Montgomery *et al.* (SRS Tech.)
A Mars Outpost: Photovoltaic Power System	D. Brinker *et al.* (NASA-LeRC)
An International Testbed for a Manned Mars Mission	A. Hanson (Comm. Space Tec.)
Pre-Positioning of Logistical Elements in Mars Orbit Utilizing Solar Sails Using ET's for Cargo Pods	A. Levi (Anco Engin.)
Mars Mission Effects on Space Station Evolution	B. Askins *et al.* (NASA-HQ)
The Space Age in Transition	S. borowski *et al.* (NASA-HQ)
Computer Support for Mars Missions	Ned Chapin (Info.Sci.Inc.)
Multiple Mini-Rovers to Augment a Mars Rover Mission	W. Pryor (CU-LASP)
Utilizing a Multi-Objective Program Model to Design Surface Vehicle	D. Cadden (Quinnipiac)

SESSION: TRANSPORTATION SYSTEMS

Advanced Technology for a Piloted Mission	B. Roberts (NASA-JSC)
Sea Dragon Launch Vehicle for a MM	R.C. Truax (Truax Engin.)
Heavy Lift Vehicles for Transportation to a Low Earth Orbit Space Station for Assembly of a Humans to Mars Mission	Frank Swalley (NASA-MSFC)
DOD Heavy Lift Launch Program	T. Shore (SDIO,Pentagon)
Transportation/Propulsion Considerations For Fast Transfer To Mars	P. Harris *et al.* (Rockwell)
A Transportation System for Permanently Inhabited Mars Bases	B. Roberts (JSC)
NEP Freighter: A Point Design	Paul Phillips (Eagle Engin.)
Transportation Options for Sustained Mars Habitation	P. Penso (JPL)
Modular H/O Vehicle to Meet Manned Mars Transportation Requirements Utilizing Space Station	R. Corban (NASA-LeRC)
Mars Space Transportation Systems	M. Moore *et al.* (NASA-MSFC)
Vehicle Condition Monitoring For a Mars Mission: Issues & Needs	L. McCauley *et al.* (Battelle)
Application of Low L/D Aeroassist for a MMM	W.H. Willcockson (Martin Mar.)
Space Elevator Surface Attached Tether into Orbit	H. Rackley (Martin Mar.)
Requirements for Mars Launch and Landing	James French (Amer.Rocket Co.)

SESSION: ADVANCED PROPULSION

High Speed Mars Missions	M. Pelizzari (Lockheed)
Nuclear Propulsion, The Road to Mars	S. borowski (Prop. Analist)
! → Performance of Electric ~~Propulsion~~ ~~of~~ Chemical ~~Systems~~ Propulsion Combinations for MMM	B. Cordell *et al.* (Gen. Dyn.) ← I'n “al
A Feasibility & Performance Study of Nonchemical Propulsion Concepts	B. Nassersharif (TX A&M)
A Mars Cargo Delivery System Based on Advanced Solar Sails & Aerobraking	J. Garvey *et al.* (MACDAC)
Review of Selected NASA Lewis Studies on Trajectory Modes & Nuclear Propulsion Arrangements for a MMM	E. Willis (NASA-LeRC)
Hydrogen Cooled Nozel	F. Chang (NASA-JSC)
Electric Propulsion	T. Cole (JPL)
High Energy Density Nuclear Engines	A. Beal (Airforce Astro.)
Laser Propulsion	J. Kare (Lawr. Livermore)
Advanced Ion Drive	J. Sercel (JPL)
Advanced Propulsion to Mars	R. Forward (Hughes Res. Lab.)
Survey of Potential Anti-Proton Based Powered Propulsion Systems	Steve Howe (LANL)
The Pegasus Drive, A Nuclear Electric Propulsion System for the Manned Mars Mission Cargo Transport Space Craft	Ed Coomes (Battelle)

SESSION: SPACE POWER SYSTEMS AND APPLICATIONS

The SP-100 Space Reactor as a Power Source for Mars Exploration Missions	L. Isenberg *et al.* (JPL,NASA-LeRC)
Size & Mass Characteristics of Megawatt Nuclear Power Sources	D. Carlson (LANL)
Space Station Power Requirements	S. Gutersloh *et al.* (TX A&M)
Power Considerations for Early MMM Utilizing a Space Station	M. E. Valgora (NASA-LeRC)
Laser Power Transmission for Martian Applications	R. DeYoung *et al.* (NASA-LaRC)
Overview of Power Requiremets for MMM	D. Schnyer (NASA-HQ)
Lasers in the Quest of Mars	J. Rather (Kaman Aero.)

SESSION: MOBILITY ON MARS

A Mars Rover Transportation Vehicle for MMM	K. Faymon *et al.* (NASA-LeRC)
Mars Airplane Revived: Global Mars Surface Surveys	R.W. Augenstein (Rand Corp.)
Balloons and Their Physical Characterization	F. Redd *et al.* (Utah State U)
The Mars Ball, A Prototype Martian Rover	D. Janes (Univ. Ariz.)

SESSION: MARS BASE: SURFACE INFRASTRUCTURE/TECHNOLOGY

Inflatible Structures	M. Roberts (NASA-JSC)
Key Technologies For Viability of a Permanent Mars Base	K. Fairchild (NASA-JSC)
SLATS Concentrator For Mars, For Photovoltaic Application	T. Stern *et al.* (Gen. Dynamics)
High Frequency Utility Power for MMM	J. Mildice (Gen. Dynamics)
Bringing Mars Virtually Down to Earth: Description of MIDAS	M. McGreevy (NASA-HQ)
Martian Base Activation Scenario	H. Schmitt (Consultant)
How To Colonize Mars on a Budget	T. Wray (Orbital Path)
Fire Protection on Mars	R. Beattie (Boeing)
Power, Propulsion & Communications Perspectives on Possible Mars Base Locations	G. Horsham (NASA-LeRC)
Evolutionary Communication Systems for Mars Exploration	S. Stevenson *et al.* (NASA-LeRC)
Scenarios for a Mars Surface Base	J. Alred (NASA-JSC)
A Recommendation for a Mars Base: Prototype in Antarctica	D. Morrow (Architect, CO)

PAPERS OFFERED FOR CASE FOR MARS III (TENTATIVE)

Building Mars Habitats Using Local Materials	B. MacKenzie (Independent)
Automated Mission Planning for Manned Mars Research Station	J. Tomayko (Wichita State U)
Energy Storage Considerations For an Uninhabited Mars Surface Sampler	P.M. O'Donnell *et al.* (NASA-LeRC)
Using Robots to Assist & Support Human Explorers on the Surface of Mars	R. Jones (Phillips Petro.)
The Need & Evolution of Construction Robotics for Working in Space	R. Leonard (Ad-Astra, NM)

SESSION: MARS RESOURCE UTILIZATION

Design of a Mars Oxygen Processor	R. Ash (Old Dom. U)
A Hydrogen Peroxide Economy	D. Pettit (LANL)
Prelim. Study of a Water Based Space Propellant Resupply Station	K. Watts (Rockwell)
Duricrete & Composites Construction on Mars	B. Clark *et al.* (Martin Mar.)
Surface Based Factory For Production of Life & Technology Support Products	P. Biney *et al.* (Praire View)
Martian Mining	T. Budnick (Layman)
Design of a Propellant Production Plant on Phobos & Impacts on Mars: Exploratory Mission	E. Christiansen (Eagle Eng.)
Block II Mars In Situ Resources Processes	R. Giudici (NASA-MSFC)
Applications of In-Situ Propellant Production	M. Clapp (USAF)
A Carbon Dioxide Powered Rocket	D. Pettit *et al.* (LANL, Mart. Mar.)

SESSION: LIFE SUPPORT

Human Adaptation to Long Duration Space Flight	H. Schmitt (Consultant)
Death in Space II	R. Beattie (Boeing)
Surviving the Radiation Hazard on the Road to Mars	B. Clark *et al.* (Martin Mar.)
Life Sci. Considerations for a Mars Trip: G or no G	J. Mason *et al.* (NASA-JSC)
Expected Visual Envir & Effect on Human Activity	R. Haines (NASA-ARC)
Design Trade-Offs For a Partially Closed Ecological Life Support System	J. Rummel *et al.* (NASA-HQ, N.Y.U.)
Economic Feasibility of Microbial CELSS	R. Boudreult (Canada Astro.)
Life Support System Considerations & Characteristics for a MMM	F. Powell (Life Systems)
A Diagnostic & Environmental Sampling/Monitoring System Concept to Support Manned Mars In-Flight & Surface Operations	C. Buoni *et al.* (Battelle)
Exercise Strategies for Minimizing the Effect of Microgravity	G. Swanson (CU Med. Ctr.)
Germination of Wheat Under Assimilated Martian Atmosphere Supplemented w/Oxygen	R. Mancinelli (NASA-ARC)
A Zero-G CELSS/Recreation Facility for an Earth/Mars Crew Shuttle	A. Eichold (UC-Berkeley)
Space Station Accomodation of the Sciences in Support of a MMM	B. Meredith *et al.* (NASA-LaRC)
Genetic & Immunological Considerations Necessary In Selecting the Crew for the 1st Mars Expedition	R. Ziegler *et al.* (Phila. Mars Soc.)

SESSION: HUMAN FACTORS

Habitability Design For Long Duration Space Missions	J. Stuster (Anacapa Sci.)
Manned Exploration of the Inner Sea: Lessons Learned in Another Hostile Environment of Mars	J.K. Orsech *et al.* (Scripps)
Antarctica as a Model for Human Exploration of Mars	L. Palinkas (Naval H.R.C.)
Space Personnel Deployment Systems	P. Harris (Cal. Space)
A Biochemical Model For Basic Job Skills	R. Bruner (Mtn. Bell)
The Ice-T Scale: Assessing Perceived Adaptability of Spaceflight & Living Conditions	A. Harrison (U.C. Davis)
Scientists on Mars	B. Clark (Martin Mar.)
Crew Selection For A Mars Explorer Mission	B. Clark (Martin Mar.)
Crew Composition & Training Considerations for a MMM	M. Engle (Lockheed)
Human Models for Human Offworld Colonies	J. Funaro (Cabrillo Coll.)
Psychological Issues Impacting on the Success of an Int'l Crew for a MMM	D. Cadden *et al.* (Quinnipiac)
Medical Training Requirements for MMM Astronauts	H. Filbert (Martin Mar.)
Getting the Most from a Mars Base: Some Lessons from the Field of Facilities Management	J. Wise (NASA-ARC)
Personal Characteristics & Mission Parameters as Determinants of Space Flight Environment Habitability	A. Harrison *et al.* (U.C.Davis)
Human Aspects of Mission Safety	Mary M. Conners

SESSION: SCIENTIFIC GOALS

The Field Search for Martian Fossils	H. Schmitt (Consultant)
The Role of Field Biologists on the Martian Surface	Penny Boston (LARC)
Field Search for Ancient Stromatolites on the Surface of Mars: Lessons from the Earth	S. Awramik
The Role of Field Geologists on the Martian Surface	TBD
3-D Geological Structural Modeling Using Stereopair Remote Data	K. Leitner (CU-LASP)
The Role of Climate Studies in Future Mars Exploration	D. McCleese (JPL)
The Mars Dynamics Observer: Proposal for Aero-Stationary Mars Orbiter	E. Strickland (Wash. U)
Oxidation State of Iron in SNC-Meterorites as Studied by Mossbauer Spectroscopy with Application to Mars	J.M. Knudsen (Orsted Inst.)
Mars Soil	A. Banin (Heb. U)
Viking Computer Facility Late Mission Operations & Restoration of the Lander Master Data Record Set	J. Tillman *et al.* (Univ. Wash.)
Status of the Viking Lander Meteorology Data Set	J. Tillman *et al.* (Univ. Wash.)
A New Mode of Global Atmospheric Oscillation & the Initiation of Global Dust Storms	J. Tillman *et al.* (Univ. Wash.)
Spectroscopic & In-Situ Trace Gas Measurements: A Possible Indicator of Microbial Life on Mars	J. Levine *et al.* (NASA-LaRC)
Search for Mars Lander/Rover Return Sample Sites	H. Masursky *et al.* (USGS)
Mars Jars: Laboratory Simulations of Conditions on the Surface of Mars	C. Stoker *et al.* (NASA-ARC)

SOCIAL, ECONOMIC, POLICY & EDUCATION SESSIONS

SESSION: SPACE POLICY

A Different Race: Space as a Strategic Alternative to the Nuclear Arms Race	R.S. Leonard (Ad Astra.)
Cooperative Manned Mars, Arms Reductions, Early Education & Economic Stability: A Harmonius Quartet	J. Tillman (Univ. Wash.)
The Influences of SDI on a Mars Mission	D. Rotegard (Univ. Minn.)
International Cooperation Issues	J. Oberg (McDAC)
InterMars: An International Mgmt System For Martian Settlement	H. Schmitt (Consultant)
The Politics of the Millenium Project: Mars 2000	H. Schmitt (Consultant)
Exploration Strategy As a System of Interest Relations	K. Lavdas (Greece?)
1990 Parallel & Simultaneous Cooperative Int'l Expeditions to Mars: Simulated Missions w/Mixed Crews	R. Ziegler (Phila. Mars Soc.)
Let's Go to Mars With Our Allies & and Our Friends	M. Michaud (State Dept.)
Space Law Policy	N. Goldman (Attorney)

SESSION: ECONOMIC POLICY

Financing Interplanetary Exploration, Innovations & Limitations	C. Smith (Ball Aerospace)
Marketing Mars	S. Lueder (Conn. State U)
Economic Incentives for MMM: Development of Extraterrestrial Resources & MMM	R.S. Leonard *et al.* (Ad Astra.)
The "America 500" Space Initiative	T. Ostindien *et al.* (Priv. Eng. Co.)
Financial Modeling for Space Enterprise	D. Rotegard (Univ. Minn.)
Program Economic Windows	H. Mandell (NASA-JSC)
The Mars Goal: Jumpstart to Commercial Innovation in Space	N. Wood (Space Fnd.)

SESSION: SOCIAL FACTORS

How Space Enthusiasts View Mars Exploration	R. Staehle (World Space Fnd.)
Anthropological Analogies for Human Exploration of Mars	C. Amato *et al.* (Sys.Res.Cal.State)
Manned Earth Exploration Program & Techniques as Analogies for Human Exploration on Mars	J. Klassi (Exped. Earth)
The Martian Prisoner's Dilemma	R. Beattie (Boeing)

SESSION: EDUCATION

Mission to Mars: A Traveling Science Gallery & Learning Environment	Don Eldredge *et al.* (Battelle)
Space Education in a Space Theater Setting	G. Ammarell *et al.* (Fiske Plan.)
A Multi-Image Program on Space Exploration & Education	L. Friedman (Plan. Soc.)
Introduction to Legal & Social Implications of Missions to Mars	J. Hofgard (CU, Space Law)
From the Classroom to Mars: One Giant Leap for Students	C. Petersen (Fiske Plan.)
Space Education Through the United Space Foundation	T.B.D. (USSF)

Mars Underground News

VOLUME I, NUMBER 2 SPRING 1987

NASA DELAYS MARS OBSERVER

Despite unprecedented public and congressional support for the Mars Observer, NASA has delayed the mission launch from 1990 to 1992.

Ironically, NASA ordered JPL to stop work toward a 1990 launch on the same day that US Secretary of State George P. Shultz and Soviet Foreign Minister Eduard A. Shevardnadze signed an accord on space cooperation. A focus of that accord is cooperation on robotic missions to Mars, and the Mars Observer is specifically mentioned.

NASA's reported reason for delaying the mission was inadequate funds. The agency also asserted that the space shuttle schedule is over-booked and they were not able to obtain an expendable launch vehicle (ELV) for a 1990 launch. However, both the Air Force and Martin Marietta (builder of the workhorse Titan) said that the necessary ELV could be had for $130 million.

NASA estimates that it will cost $125 million to delay the Mars Observer to 1992.

US-SOVIETS SIGN SPACE COOPERATION PACT

On April 15, US Secretary of State George P. Shultz and Soviet Foreign Minister Eduard A. Shevardnadze signed an agreement on cooperation in space exploration. The pact reinstates a 1972-1982 program that the US refused to renew to protest martial law in Poland.

Sixteen cooperative space activities are called out in the agreement, covering solar system exploration, space astronomy and astrophysics, Earth sciences, solar-terrestrial physics, and space biology and medicine.

The exploration of Mars is a major focus of the agreement. An unnamed Western diplomat told the New York Times that "the principal immediate prospect was the coordination of separate American and Soviet unmanned missions to Mars and to one of its moons, Phobos."

A Mars sample return mission and other precursors to human landings on the Red Planet are not specifically named in the agreement, but the accord will facilitate cooperative work toward that goal.

NASA's "BRIGHT NEW VISION" --OR MORE STUDIES?

The US civilian space program is now searching for new goals and objectives. Among the initiatives under review is a commitment to extend human presence to Mars.

With little fanfare, a space agency Senior Management Strategic Planning Council has embraced one new long-term target: "Expand human presence beyond the Earth into the solar system." But what specific objectives fall under such a goal? That's where the squabbling starts.

As now outlined, NASA is evaluating four initiatives:

--An augmented study of Earth, its environment and the effect of human activity on the biosphere;

--An enhanced program of solar system exploration;

--Establishment of a permanent scientific base on the Moon;

--A series of robotic missions to Mars, followed by human exploration.

Human flight to Mars as a NASA goal recently won support in a report spearheaded by former astronaut Michael Collins. As chairman of a 12-person NASA Advisory Council Task Force on Space Program Goals, Collins explained at a March meeting that "exploring and prospecting on Mars"' should be NASA's "primary goal," and the agency "should state so publicly."

But before humans sojourn on Mars,

extensive unmanned robotic study of the planet is essential. Task teams at NASA's Johnson Space Center in Houston and at the Jet Propulsion Laboratory in Pasadena are outlining scenarios of a robotic sample-return mission. The mission would involve a Mars orbiter, an automated surface rover and an ascent vehicle to propel atmospheric and surface samples first into orbit and then Earthward.

If approved and funded, such a mission could be launched in 1998 and return with an 11-pound scoop of Mars in 2001. A more accelerated schedule is also contemplated--to bring Mars samples back before the turn of the century. Options are being weighed as to possible coordination of the US project with similar Soviet planning.

One individual conscripted to help NASA sort out its future is astronaut Sally K. Ride. She is now formulating a study tagged "Space 1995"--a timeframe in which the US space station would be operating. She is reportedly focusing not only on possible Moon and Mars missions, but also on a comprehensive effort to monitor global phenomena on Earth. The study is due before June.

The race is on. Will NASA focus on a bold new goal for space before running out of paper?--Leonard David

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MARS SCAN

METEORITE TRANSPLANTS: Researchers at the California Institute of Technology recently theorized that baseball-sized meteorites, collected from various parts of Earth, may have come from Mars, blasted to Earth eons ago when Mars was clipped by a giant comet or asteroid. Their belief is partly based on the gases concentrated in the specimens, with elements similar to those sensed by Viking landers in the martian atmosphere.

ANTENNA ATTENTION: The Crimea-situated RT-70 radio antenna, used during the Soviet Vega encounters with Halley's Comet, is being modified for the Soviets' 1988 mission to Mars and Phobos. New transmitters, more efficient communications bands and faster computers are being installed at the facility.

AD CAMPAIGN: "The first person on Mars is already alive on planet Earth." That was the bold proclamation in full-page ads appearing last March in such newspapers as the Washington Post and the New York Times. The advertisements were developed by Boeing, the aerospace company, in support of the US space station --from which it hopes to make a great deal of money. Claimed the ad, "In addition to the immediate benefits of this great challenge--new technology and jobs--the space station is a stepping stone toward Mars."

SOVIET PLANNING: The March Lunar and Planetary Science Conference in Houston provided a forum for Soviet researchers to unveil a number of new Mars missions now being prepared in the USSR. According to Soviet scientist Valeriy Barsukov, a spacecraft designed to orbit Mars in 1992 will deploy surface penetrators, unleash a French-designed atmospheric balloon and, perhaps, drop a mini-rover on the martian terrain.

Another mission, possibly in 1994, would involve a heavily instrumented Mars rover, partly dedicated to search for life. According to Barsukov, a 1996 Soviet project under consideration would return surface samples as well as map the planet by radar.

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PUBLIC PULSE: One statistic in a report to the National Science Foundation about public attitudes toward the space program after the Challenger accident indicates support for human flight to Mars. According to Northern Illinois University pollster Jon D. Miller, a clear plurality of those interviewed (49%) held that the American space program should try to land astronauts on Mars within the next 25 years. Some 36% disagreed.

MARS BALLOONING: JPL and Caltech scientists are studying "Mars ballooning" as one method to explore the planet. Tests using a black, solar-heated, hot-air balloon attached below a smaller gas-filled balloon are underway at NASA's Dryden Flight Research Facility in California. The concept uses heat from the Sun to inflate the larger black balloon, thereby providing lift. At night, the smaller gas balloon supports the deflated hot-air balloon, while an instrument payload conducts surface experiments. As envisioned by JPL engineers Gail Klein and James Burke, the balloon technique would be ideal for Mars' day-night cycles, using martian wind patterns to carry instruments across the surface of Mars.

THE REFERENCE SHELF

Lunar and Planetary Institute publications on Mars include:

--LPI TR-86-07: MECA Workshop on the Evolution of the Martian Atmosphere; 52 pages.

--LPI TR-86-09: MECA Workshop on Dust on Mars II; 77 pages.

Both publications: US $3.00; foreign air mail $6.00, surface rate $3.50. Contact: Order Dept., Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4299.

The Next Giant Leap: An Agenda for International Cooperation is a report of the United Nations Association (UNA). The 70-page study calls for reinvigorating the role of the US and international organizations to open up space for all humanity. It specifically calls upon the US and the USSR to coordinate plans for robotic Mars exploration and future multilateral human missions. Cost: $5.00. Contact: United Nations Association-USA, 300 East 42nd Street, New York, NY 10017.

The Voyage of the Ruslan--the first manned exploration of Mars by Joshua Stoff is a children's book based on up-to-date information on Soviet and US space research. The 104-page story, replete with bibliography, details an expedition of Soviet cosmonauts who touch down on Mars in 1993. Accurate in detail and plausible in strategy, one wonders if this simple book is surreptitiously intended to goad US readers to new heights. Cost: $12.95. Contact: Atheneum Publishers, Juvenile Dept., 597 5th Ave., New York, NY 10017

"The Climate of Mars" is an article published in the May 1986 Scientific American, and written by Robert Haberle, research scientist in the theoretical studies branch of the space sciences division of NASA's Ames Research Center.

"This Way to Mars" is an editorial carried in the August 9-15, 1986 issue of The Economist. It calls for a joint US/Soviet venture in Antarctica as a prerequisite for establishing a joint Mars base in the next century. The opinion is followed by an article on research at the poles.

"Project 2000--a manned mission to the moons of Mars" was carried in the Fall 1986 Policy Review. Authored by senior scientist S. Fred Singer, the article explains the virtues of mounting an expedition of 6 to 8 astronauts to the martian satellites Phobos and Deimos. This US effort would take place in the millennium year 2000.

"The Limits of Manned Space Flight--could human beings survive the journey to Mars" was printed in the September/October 1986 issue of The Sciences. Written by William DeCampli, a senior resident in general surgery at the Stanford University Medical Center, this is excellent and most interesting reading.

CASE FOR MARS III

"The Case for Mars III: Strategies for Exploration" will be held July 18-22, 1987 at the University of Colorado, Boulder. Sponsors include The Planetary Society, the American Astronautical Society, Jet Propulsion Laboratory, Los Alamos National Laboratory, and NASA's Ames Research Center, Marshall Space Flight Center and Johnson Space Center.

The program is dedicated to defining innovative programs for exploring Mars. It will include analysis and discussion of scientific, technological, mission design, social and policy strategies for robotic and early human missions to Mars. Special emphasis is put on international programs as a way to carry out Mars exploration.

The conference will include technical workshops and panel discussions. Special public and education days are to be held on July 18-19.

For more information and/or registration material, contact:

Case for Mars III
PO Box 4877
Boulder, CO 80306
303/494-8144

MARS SAMPLE RETURN STUDIES AVAILABLE

JPL D-3922, report on "Mars Rover 1996 Mission Concept" (Partial results of the 1986 preliminary study of a Mars rover/sample return mission, edited by James E. Randolph.

JPL D-3114, report on 1985 study "Mars Sample Return Mission, edited by James R. French (JPL) and Douglas P. Blanchard (JSC).

NASA report on "A Preliminary Study of Mars Rover/Sample Return Missions" conducted by the Mars Study Team, Solar System Exploration Division, NASA Headquarters, January 1987.

UPCOMING ACTIVITIES

Lunar and Planetary Institute planning conference entitled "Mars Sample Return Science Workshop." November 16-18, 1987.

Johnson Space Center is requesting input for a document looking at the scientific requirements for a sample return. Contact: Dr. James L. Gooding, Code SN-2, NASA Johnson Space Center, Houston, TX 77058.

Mars Study Group formed, with management at JPL and JSC. First meeting of Science Working Group, April 23, 1987.

The National Academy of Sciences is conducting a study on international cooperation on future Mars missions.

Conference on "The Human Experience in Antarctica: Applications to Life in Space," sponsored by NSF and NASA, August 17-19, 1987. Contact: Albert A. Harrison, Dept. of Psychology, UC Davis, Davis, CA 95616.

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An Apa-Tech zine for issue # 53. If you gave Connie money, you might want to read the last section (Ishercon News) first for the news flash. Yep - you guessed it.

Mailing Comments
Apa-Tech #50

Valli - Well, the ditto worked (more or less), but what will it do to the reputation of our previously totally high-tech Apa?

Susannah - First ditto than a mere typewriter. What **are** we coming to?!

John - You are now the oldest *active* member. Tullio is 38, but since he's no longer active I don't think that counts.//re Ishercon - it **was** OK! Yes you'll be invited (now that I have a quick reference for your address).

Bonnie - You think of me as "a mature, responsible adult"?! I wonder what I'm doing wrong...

Hugh - I just can't imagine living in a place where you can't tell when the seasons change.

Barry - Just who are the one or two possible exceptions among us who aren't "able to make a sharp distinction between fantasy weapons and violence and the real thing"? (I know - gotcha!)

Steve - One of the problems with signifying a joke is that you'll have the same problem only worse - everyone will know that it's a joke, but if they don't get it it'll only make them feel worse. The way it is, a subtle joke might well sail right past me and I'd never notice that I don't get it.

Dave - re colorization - they are getting lots of people to tune in to see what it's all about, but I'm not sure how long the novelty will last. I've seen ads for *The Sea Hawk* on video cassette - "now available in full color and the original black and white".

Guy W. - Maybe I'm just too gullible, but I have a tendency to believe that my friends don't lie to me, and that they wouldn't intentionally allow me to remain in a situation (especially of their making) which could prove to be fatal - if you tell me it's OK, and that the fire will be out in a minute, I'll give you at least a minute to prove it - then I'll panic.

Marty - You guys seem to have slacked off on the war games - are you bored or just out of time again (or are you trying to save my marriage by keeping me from feeding information to the enemy?)

Barry/Bill - **WOW!** I'm Impressed. What's wrong with those California women anyway - not a single swoon? I really enjoyed your account - I think the whole was greater than the sum of two parts would have been.

Kiran - re the Blue Angel catalogue - since we will be driving to Atlanta again this year (for WeaponsCon at the end of July), if anyone wants to put in an order for fireworks we can get them cheaper than the catalogue prices. We'll probably stop in Tennessee and pick some up.

Rod - Reading that "This is being written during what I hope will be the last snowstorm of winter" while I sit sweltering in 90° heat and 90% humidity tells me how long it's been since I've written.

Greg - Does it bother you when news reporters (who should know better) say someone was found "innocent"? I was taught that there is no innocence in a criminal court of law - only "guilty" or "not guilty beyond a reasonable doubt".

Apa-Tech #51

Rolf - re yr ct me - Will you come on the first day? Will you leave on the last day? Will Mary be with you? Will you be bringing food or money or both? - The one thing that I really hate about apas (or the written word anywhere) is that there is no way to know with what inflection a statement is made. I hope I'm wrong, but I read your inflection to be rather on the rude side. I put a lot of time and effort into our party and I don't think it's unreasonable to expect a little thoughtfulness and courtesy in return.

Susannah - re yr ct Kiran - our friend Sue Carter has a slightly different problem - her profs get upset when they find out that she has three majors (physics, chemistry and math)!

Rod - Sorry about the monetary mix-up - it should be fixed by now. If such things happen again, just beat me over the head with the facts and I'll fix it.

Bonnie - There were places for you to go and talk away from the bullets (the kitchen, the computer room, the basement, the attic, my bedroom [if you had asked], Marty's house). Obviously if you had that much trouble getting away from it, "this so-called form of fun" was fun for a large portion of the guests. Everyone wants me (as the hostess) to control behavior of other people when there is a disagreement as to what is "fun" or what should be done now. The problem is that this only applies to *other* people - nobody wants me to control *their* behavior (because they are, of course, always doing the **right** things). There may well be a repeat of the war zone this year. Or not. I have no way of knowing - it wasn't a planned event, it just happened (along with 90% of all activities at all Ishercons). Some things are very popular for many years, others only for one year, others only every three years, so we just have to wait and see. But people should realize that it is a definite possibility that it will happen again in the future.

Valli - I agree - my friends in GT seem more special than the rest of the world, and so I can only hope that any break-ups (or any joinings for that matter) will make all of my friends happier in the long run.

Greg - re yr ct me - I still haven't read the book! (I tried a couple of months ago, but there were too many other far more interesting things to do - maybe on the flight out to Oakland.)//I do wear an air filter mask while working with the toner - and I've told Alex that if/when I get pregnant I will no longer be available for that job.//As I've already mentioned to you - more than 50% of the apa being franked seems a bit excessive to me. I'm not sure what can or should be done about it, though. We'll see what the masses have to say.

Guy W. - Maybe you should bring a copy of Nuclear Monopoly to Ishercon this year. About how long does one game take (and how many people can play at once)?

Apa-Tech #52

Linda - I assume that the penned portions of your drawing spell out Apa-Tech (or something equally significant). True?

Shalmaneser - Thanks for taking care of the indices - it was a real help.

Lee - You're doing fine!//Does the Topological Twist have its own tune, or is it a filk?

John - re yr ct me - sorry, no oxy-hydrogen - all we have is an oxy-acetylene torch.

Guy W. - Let me get this straight - you go eat raw fish while you cook yourself? I guess that is the ultimate California experience.

Rod - It seems that you go to a fair number of cons, but they hardly ever seem to overlap with ours. Maybe NASFiC?

Susannah - re Apa-Tech #2 - it's probably a combination of both. The first issues were mostly ditto, and we had a wide range in readability from one zine to the next.

Kiran - As I suggested to Rod some time ago, I suggest to you - put some type of delimiter (/, *, •, —, etc.) between subjects in your mailing comments. It makes them much easier to read (I guess it's like a clutch to my mind - it helps me to shift gears).

Scott - Welcome!//I was one of those who said I didn't want to see *Labyrinth* again, but I really enjoyed it anyway -thanks.//We hope to make it down for the Airshow Berserker (depending, as usual, on time, money, car availability, and the phase of the moon).

Steve - I also like the Turner colorization better, and *Captain Blood* and the *Sea Hawk* both seemed fine to me when I watched them (but then, I don't notice mat lines either).

Bob & Connie - I'm really glad that you're enjoying your new job so much. I'd have preferred it if you had found one in Kalamazoo, but so it goes. Thanks for putting us up Thursday and Sunday night - it was (mostly) fun. Guy said he couldn't tell I was wasted - next we get Marty.//Corrections to your Isherfund list: Marty's last name is Franz, Parr's last name is Crone, it should be Jim Fuerstenburg (I'm not even positive that I've spelled his last name correctly). Other than that it looks good. More on the results later in this issue.

Marty - Since I was reading over your shoulder as you wrote this, you've long since heard all of my comments ("but I **like** crude rodent pointing devices...").

Rolf - Did you really have a price $2000 better?

****

Ishercon News

Isherfund update - I won't beat around the bush - we now have a forty gallon water heater. Yay! Thank you to all of you who cared enough to contribute, and to Mary Lynn and especially Connie for organizing the collection. We do have some money left over, so we're looking into getting the front door fixed with the excess plus some money from my job with Alex.

Since this will be the tenth Ishercon, we want it to be really special and spectacular. One of the things we're working on is a scrapbook (actually it'll be multiple scrapbooks) of the previous Ishercons. If anyone has pictures which they can send to be included, you can either send them here or to Mary Lynn who has ~~foolishly~~ volunteered to put the books together. If you can find negatives, she can get them developed at Osco (where she works) for half the normal price. If you can't afford to have the pictures developed, we'll pay for them (this offer may be withdrawn at any time due to our finances). I'd like to be able to keep the books and add to them, so I'd prefer if you didn't send pictures that you wanted returned, but if that's all you can do we'd appreciate that too.

Also I want to look into renting a hot tub for the party - I'm not sure where we'd put it, but I figure it's worth looking into. I know they have some to put into your home, but I'm hoping to find a large one which is enclosed for outside use. If I can find that I figure we'll put it right outside our side door. Any comments or suggestions?

Our food budget may go up this year also - Reneé wants to do barbecued ribs again, and in fact may be in charge of all the food this year. If she is, she'll probably go for more gourmet type things. That's all really iffy though, so I'll wait and see what develops with that.

Any ideas for things to do or places to go are welcome. Like I said, we want this to be a really great party, so let me know what you think. I can't promise that we'll use it, but I do promise that we'll consider it.

****

Well, I've still got loads of stuff to do before we leave for San Francisco in two days, so I better stop here. Hopefully I'll have more time next month (but don't bet on it).

Donna

Fractal Realities #.012018309
A Zine for Apa-Tech #53
By Hugh Daniel

Ah, always a good way to start a project, rearrange your room and maybe even clean it up a bit. Lets see now I have have the terminal, reference shelf, modem, SF, headphones and stereo all within arms reach, perfect!

Kiran asks how one can live here in California? I do wonder... We almost have some weather today, at least the sky is grey and its NOT fog. I think it going to take some work learning how to feel the earth out here where it does not kick one in the rear!

Discussions in Progress

I offten meet people that tell me to hate Nukes (Whats a Nuke, Daddy Higgings?) and maybe even the people what make them. I also run into folks that do not know how to shoot a gun or defend them selves, and tell me that I ought not know how to do these things.

This is very confusing to me at some deep level, because I was brought up a pacifist, and got roundly trounced for years because of it. As I got older and knew more about the world I came to realize that there is a balance between pacifism and aggression. I see at least three opposing forces pulling here, 1. Nature (Darwin), 2. Morals (Church) and 3. Overlords (Government).

These forces pull in different directions at different times, (Government will want a person to be totality peaceful most of the time, then at times of conflict it will want strong aggression from its members) and it can be very hard for a person to come to terms with themselves on this issue. Very few societies come close to a consensus, and those that do are either very strong (aggerssion) or are to week to survive. Both cases are dangerous, nations that are to strong are wiped out by their neighbors (thorough there own aggression often) and nations that are to peaceful are offten wiped out by some strong nation for a host of reasons (they might turn hostile, we need their FOOBARS, etc).

What got this all started was the stuff about the bomb-defuseing games, I have put forth a small amount of my thinking here. What I really want to stress is my conclusions: The Universe has many things in it, blinding my self to some of them can only hurt me in the long run.

This means that I/You/Them/We need to learn to live with each other, Fission/Fusion Bombs and anything else that we or the universe throws at us. Kind of a hard task, but it can be fun this living.

I was goning to may a bomb to Isher House, but then I thought about it for a while...

Every noq and then I hear something powerful, that someone ought to make a better world for our children. If you get a chance lessen to a cut off of Chris DeBurgh's Album The Getaway, the last song on the first side has a very moving statment that (semi-quote) our generation has lost its way, we don't know what were giving to you (end-semi-quote), and goes on to hope that his child can make a better world and that he would like to help MAKE IT A BETTER WORLD FOR HER.

There is no way I can fault this thinking, it is one of the few powerful things that has really changed the world over the last 1200 years. *BUT* I do. I do not fault it for what it is, I fault it for what it lacks.

What it lacks is immediacy, many of the people now alive might live for hundreds of years (if not thousands) and if they don't make the world a better place for themselves now, *WHEN* are we (its 'we' no matter how much we like to talk about 'they' and 'them) going to make it better for our children?

If we work on a better world now, just think how much more we will have to share with our children. Just think how happy kids would be their parents were not mostly around the bend?

Most people seems to have an almost allergic reaction to my little tirade.

<~Time~Gash~> <Then a blinding white light><No, not the Faralons light house!>

I work for a better world for myself and my loved ones. I can measure my success by whether it is a better world for our children.

<The light dims, but it shall grow bright again...>

Thoughs of the Day

Well, as always Apa-Tech is a learning experience for me. About six weeks ago I became a Emacs (GnuEmacs) user. Emacs is one of the most powerful editors that exists. It also has one of the worst user interfaces that has ever existed! But it has wonders like spell checkers that are useful, though I am now rewriting them to be really useful! Computer hackers will put up with such junk!

In my wondering across the face of the information landscape, I have ended back up in the fog and mist of the Hypertext highlands. Apa-Tech has been affected by it also, this is my first zine using some of the methods that I have been working on for my hypertext system. Mostly while doing this zine I wished I had a better idea of how to write, and secondly knew more about the writing part of hypertext.

In any case I have to think about how I wrote this, and see if I can figure out how it can be done better. This is the sort of tech that I have been doing in the last few months. One of my big thinks was discovering that writing in your text book is incredibly useful in helping digesting the information inside it!

As always things are changing for me. For about six months I am eating a vegi non-dairy/meat/fat/sugars diet. It goes (a little to far) in the direction I have wanted to go for a while of eating like a typical hunter gather of the last million years or so.

I have been revamping a group of Ann Arbor Ambassador terminals, hacking both their digital and analog circuits, and its wonderful. I have done almost no hardware work since I left Ann Arbor, this project has gotten me back into the hard stuff again! One day I was hacking up the vertical retrace stuff and I noticed this chip, well gollie it was a good old 555, I really wondered what that chip was useful for besides blinkies!

Mailing Comments

Uncle Bear: There is a utility for Unix to read VAX/VMesS tapes, if you want it send me mail (its small enought to send over the net I think.)

I don't think you get the same thing as B&W from turning off the color on a colorised movie.

Steve & Tullio: I want to play Significant Pursuit! Just think of all things that June Cleaver, James Bond and Gary Hart Really need to know!

Lazer Dave: Please move your text over so its not hiding in the staples! Dave, in #50 you state that "Eric's Book" is available for photocopying and that there is PostScript source, may I ask what book and who is doing all this?

Roxanne: In ish#50 you state that men don't clean dishes, mostly because they are doing other tasks (On a side issue, do women really want to take out the trash or fix the car that bad?, see I keep hearing this argument...). I wont talk for others, but besides cooking about 1/5th of ALL meals from during my childhood I had to do just under half the dishes. These days if there are enough dished I consider it almost meditation do do the dishes. (But don't even think of asking me to do dishes at my Mom's home...)

Your cite of Borborygmus bothers me a *whole* lot. I agree that I would rather have tax dollars go to doing things then just being passed on (Socialism, right? Marx verbatim). Might the problem be that we feel that we have no way to control what *OUR* Government does, so that instead of having it do X we except it only doing the lesser

evil?

Please re-read your cite and tell me how the body of it holds together as consistent system in the light of time/space/nature. Statements like 'We ultimately gain an awful lot in standard of living whenever the Government starts researching something.' are simple at best, misleading at worst.

Sigh, ok what you are doing is thinking of yourself and your friends in a local way, you want what is best now and SDI gives it to you and them. Fine, what I really want to ask you is why do you wish to think about your (and our...) life in such a limited time/space scale. Some how I feel that you are not thinking about SDI in the same time/space frame.

(I have concepts with out words. Time/Space/Nature ought to be something like 'grok' but now with the total understanding overtones.)

Roxanne, I am trying to understand why people don't sit down and figure things out as best they can. Please don't feel threatened.

Higgins: I want to go to the No Exit!

Bonnie: Powells is a truly wonderful book store, as Portland is one of my favorite palces. It is the only book store that has Maps! inside the front door so you can find your way around! Also I think that we are being hoodwinked, as every time I have been in Portland the weather has been wonderful, but then I am from the land of clouds.

Valli: I was at the Lovell's for a week. They are fine, and Endicott is going to bee a hart breaker, I gave up and started taking lessens from him! Moose, Toots & Snorchbut are living at:
482-3345 312 Sue, Bob & Endicot Lovell 345 S. Spring La Grange IL60525

Gregory: The frankings are useful, do keep them short though. On the 100 kilograms of space craft, that is what is left after the upper stage is spent. You can be as cheap as you care, as long as it lasts for a year or two is fine, even a few months is enough. What I was going for is what could really be done by a real shop (not the Nasholes, but having learned from them) in the next year or two that would be useful to send to the Moon or Mars.

In late 1979 in SciAm there was an article about what happens when you drop an Atom bomb on a Fission power plant. Not nice. SDI probably would not release that much junk, but I might not want to be in LEO that year, nor on the ground for a few years after. <sigh>

Lee: Tell us more about the 3-D projector! Sounds like you got your self in the right place at the right time! When can I hook it up to some compute! (Ok, Guy get them 3-D superconducting cubes ready, I am really going to need them now!)

What is the tune to The Topological Twist?

Dave & Susannah: I helped start Desktop Publishing, its wonderful to hear you speak of it. I will pass your comments on to Tony & Cheryl who have very little to do with Publish! now.

FYI: English is the 'Offical' language of California. But they are teaching in Spanish in the schools. I love other languages but about the only thing you need to be an American is an English speaker. I don't support 'offical(offcish!) language' movements, but the best thing a Spanish speaking family can do is teach their kids BOTH languages.

Running out of Exponent

Time to be marching on to Westercon, and next week I have something like 3 job interviews and maybe two consulting interviews. I hope to spend some time in Chicago soon, so if there are any short consulting gigs there send me a note. Could someone tell me when Windycon is this year?

Have Fun...!

||ugh Daniel
July 1 1987, Haight-Ashbury, San Francisco

An Unsuppressed Transient

Andy A. Anda
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"Your mission, should you accept it, is to plan a wedding, and apply to a large subset of the graduate schools in the known universe ... at the same time."

Well we survived the stress fest, but it got a little hairy at times. First the wedding:

Those of you who have done one of these nuptial things know that they're exercises in compromise. Why not June? Well, we wanted to be hitched when we did the grand tour of grad schools. "The person I'm living with" has much less explanatory power than husband and wife w.r.t. why we were a two body problem for schools. Our intention, for the wedding, in addition to getting the proper signatures on the official document, was to throw a great party (our first) for a number of good friends and close relatives.

My grandmother owns a unit in a building overlooking the lake here in Chicago. We found that she has free use of a wonderful meeting room in there. So we reserved it. The only restriction was that it wasn't all that large, (it could only hold fifty or so reasonably) but it had all the other necessities, including, I suppose, being excessively cheerful. We feel great pangs of regret at not being able to invite even half the guests we wanted there. In other words, if you weren't invited, you weren't being snubbed. We wanted you there but you were a victim of logistics. Personally, I was in favor of a berserker like Mike and Alice's Rochester wedding. I thought pot luck instead of rubber chicken was a fine idea. But to make a long negotiation short, my grandmother's favorite restaurant performed the catering. The food was delicious, but we missed a lot of you. Those of my relatives who were there were either my immediate family or my first cousins, uncles and aunts on my fathers side of the family. My mom is an only child too, but the relatives on her side of the family were too numerous to invite, and selective invititations would have stepped on toes.

But enough negatives. We had a wonderful time, and from reports, so did our guests. We actually had a great experience with our photographer--a friend of Robin Rodgon. There are wonderful candid shots of all our guests. The minister who performed the ceremony, Amos Wilkie, is a long time friend of the family, and he expressed the perfect service for us. At the end of the service, Annette and I exchanged two and a half dollar rings from Woolworths, as the rings that we had ordered had not yet arrived. Everyone then settled down to devour the food. If you want a replay of the food, catch the Sunday brunch at Jerome's, a restaurant on Clark St. We spent most of our time mingling with everyone and still we felt that we didn't get to be with anyone nearly long enough for our tastes: the curse of hosthood.

We didn't find the time to make a veiled and top hatted pair of carrots for the top of the wedding carrot cake, alas. We weren't wearing veils or top hats either, as we believed that our best business suits were as formal as we were willing to concede to. On that subject, we actually found Sam Paris wearing a tie.

Unsolicited advice: to get through an emotional ceremony, keep something silly up your sleeve,or leg for that matter. At the proper time, Annette pulled a lacy blue garter down my leg with her teeth. This was a relic from when I was in grammer school and had thought that the garter toss and catch was an atheletic event. (I caught a few before it sunk in that it then meant that I was to be subjected to the embarrassment of dancing with the (usually much taller and older) recipient of the bouquet.) The audience seemed to be appreciative. At some point, because she had known both of us the longest, Diana Watson was given five minutes to come up with an appropriate wedding toast. After five minutes' preparation, she delivered a masterful recounting of her view of my and Annette's first social interactions with each other. It was only slightly embarrassing. Having suffered through the second half of many weddings before, I thought it would be a nice idea to have a soft background of new age music playing to enhance conversation rather than loud dance music to drown it out. So Alice and Mike brought over their cd's and player. This worked fine until my older relatives felt the pressing urge to dance. So we listened to too much of Billy Joel, the only danceable recording in the collection. Most of our contemporaries, as I had suspected, were quite happy to continue sitting and continue with their brilliant conversations.

In late afternoon, the reception broke up and flowed out to my mother's house where it took on much more of the berserker aspect including a great sing along with Mike on six string guitar missing a couple of strings, Bill Higgins and his ubiquitous uke, myself on mandolin, and a lot of voices. The leftover food was polished off in the course of events. Running on adrenalin, we were sorry to see things break up at 2 A.M.. The next couple of days we spent with those who were staying the weekend from out of town. Our honeymoon, a couple of weeks later, consisted of the grand tour of the graduate schools.

Of the eight graduate schools we ended up applying to, we chose the five most likely, to have accepted both of us with aid. Annette had received decisions from most everywhere long before we left, but, after many phone calls, only Minnesota had sent me word of full admission before the accepted deadline. We drew up the following tour: Washington University, St. Louis; U. of Ill. CU; Purdue U.; U. of Minnesota; and U. of Maryland, College Park. Fortunately, many of the mathematics departments Annette was visiting were covering lodging and some transportation. Here are our observations:

Washington U. had good people Annette felt real comfortable with, but their focus was too narow for her tastes. They only had one person doing what I was interested in though (Numerical Analysis/Computing).

U. of Ill. UC; we crashed a couple nights with Mary and Rolf (Thanks Again) which made that part of the trip very pleasureable. (But beware of cats pounding loudly on doors in the middle of the night). Illinois had by far the best research opportunities for me, but the math department was the absolute pits for Annette. Also, the C.S. department seemed to be an ulcer factory. And, despite being outstanding in (N)umerical (A)nalysis, they lacked breadth in NA.

Purdue was next. We got there to find I wasn't admitted. C.S. admissions were run by a certifiable twit. No sour grapes involved. He explained to me that they wanted incoming students to have taken calculus. He had not noticed that I had listed only higher math courses taken, in my math major, on the application. They also wanted consultant level proficiency in Pascal, even though FORTRAN is used almost exclusively in NA. Their department is strong in PDE work, but where do they get their students from for that specialization? So scratch Purdue, an awful place to live anyway.

Minnesota was very good for Annette, and quite acceptable for me. The person handling applications was highly disorganized though, and had misplaced my transcripts and all three letters of recomendation. (He did call me the next week to tell me not to make any decisions until I got the offer of an assistantship and tuition waiver they just sent in the mail.) The department seems to have set the least obstacles to get to the point of doing thesis research: their preliminary exams have been replaced by only a coursework requirement, and their qualifier is in NA only (with a half emphasis in optimization, which I approve of). The department is in cramped quarters now, but the new C.S. building is under construction, and due for occupation in '88-'89.

We flew from Minnesota to Maryland on Friday. There I found there was another snafu in which the graduate school and the department had different application deadlines printed for the department, and the department's version was buried in some non-essential literature. The result was that I was under consideration for the subsequent year only. Well I talked to Pete Steward, a colleague of Jack Dongarra (who I worked for at Argonne), who taught there. He expressed suitable outrage and said he'd make some noise in the right places. The math department was very similar to Minnesota's for Annette.

We had to make a decision by April 15.

Only Minnesota had gotten back to me on time according to the graduate school collective agreement. Though I was willing to go without aid elsewhere Minnesota still seemed the best for both of us regardless of money considerations. So come September, you'll find both of us there. As a bonus, Annette found that of she has worked out of the three books that her three initial exams, which have to be taken by the end of the second year, are to be taken from. Which puts her in a superior position to most of the other U.S. students. Annette thinks she has a fair chance to pass two of the three coming in.

A few general observations. One of the reasons that the C.S. departments were generally so delinquent with decisions was that the number of graduate applications in C.S. were averaging over 500 per school. But Annette's math departments were all in on time and expected her to respond on time too. We went a little crazy just before the deadline, not hearing from my departments like that. Because I had been working a while for some well known people in my field, I was able to do some blatant name dropping. In retrospect it was a GOOD IDEA! Professors' attitudes towards this stranger, me, went from slightly annoyed polite boredom to friendly warm enthusiasm. Often I would get second and third order referrals w.r.t. my next stop. ("and say Hi to Xxxxxx for me") I have come to the conclusion, after talking to many people, some of them in GT, that getting through successfully is of primary importance. All else is icing. I'll have ample opportunities afterwards to be adventuresome and tackle challenging interdisciplinary projects. Yes I am conservative when it comes to my future. But this undertaking is too much of a sacrifice of my time and money to not find the strongest and healthiest limb to go out on, to abuse a metaphor.

I hope I haven't bored you to tears. Alas and alack, mailing comments are being sacrificed in hopes of meeting this deadline. March is far enough away as it is. Health to All.

I never meta-pun
I didn't like.

Parenthetical Perambulations

(including Autobiographical Asides, Notes on Design Flaws of the Universe, and other Assorted Wanderings)

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News, gossip, hearsay and innuendo

Well, as of March 14, Andy and I are Officially Hitched. Folks at work keep asking if married life "feels different"; I tell them it's much like other kinds of life. (I haven't taken to housecoats and curlers, nor does Andy read the paper at breakfast, if *that's* what they mean.) We had a wonderful time at our wedding and hope everyone who came can say the same.

More on the grad school saga: Next week (I write this on March 25) we're taking off for a grand tour of all the schools to which we have been admitted (or at least not *refused* admission). This will take most of the week; I like to travel but I can't say I'm really looking forward to it. I have this terrible queasy fear (probably endemic to graduate-students-to-be) that these people have admitted me without knowing the vast extent of my ignorance. Oh well. By this time next month our future (or the next four or five years of it, anyway) will have been decided, so with this comforting thought in mind, we go on to more cheerful matters . . .

(Addendum as of May 25): We had hoped to have *some* fun on the graduate school tour (not that it had any pretensions whatsoever to being a honeymoon). However, in the course of visiting five schools in as many days (the westernmost being Minnesota and the easternmost, Maryland) we got very, very tired and I got sick (ear infection). We had a one-day rest in Washington, D.C. after visiting Maryland and all I could do was sleep. (So much for seeing the Smithsonian. SIGH.) The decision was made *for* us, as Minnesota was the only school which made both of us good offers and had satisfactory programs (i.e. ones which reflected our interests) in both our fields. So, come the end of summer, we galumph off to the wilds of Minneapolis.

Q: Are there intellectuals in GT?

A: I dunno. Better check under the bed.

The following are some ruminations on the above question, after discussions with Bill Higgins, Sam Paris, my baby sister Diane, Andy A (better half), Andy B (future brother-in-law), Diana Watson, and Random Passers-By in the Street.

Sam and Bill claim that, as American (self-declared) intellectuals define the term, techies, theorists in the hard sciences, and even mathematicians are excluded. *Real* intellectuals are poets, novelists, political essayists, and similar members of the other one of C.P. Snow's Two Cultures. Certainly, I have heard my side of this fence reviled as the abode of self-absorbed specialists and Mere Technicians. (Note that in literary criticism, the latter term is also applied to writers that the critic doesn't like but who write too well to be dismissed as Lowlife Hacks or Fumbling

Amateurs).

Now, I must confess that I don't feel quite comfortable talking about "my side of the fence". First, I'm not entirely sure that it's a good idea to draw such lines. I don't detect the clear-cut boundary between "the humanities" and "the sciences" that others seem to take as an axiom. I began my college education by studying philosophy, and a course in formal logic persuaded me that math wasn't such bad stuff after all (if proofs were involved); the transition from logic-for-philosophers to logic-for-mathematicians was practically nonexistent. The course in logic, and my own experience at arguing fine points in philosophy, theology, and politics, gave me the best possible preparation for doing proofs in advanced mathematics courses (linear algebra, real analysis, topology, etc.). In fact, I found that this somewhat unorthodox background gave me a positive advantage over students whose training in mathematics was far better than mine.

Conversely, when I sat in on a poetry seminar in the spring of my senior year, after studying mathematics for four years (summers included), I discovered that I had become a much better reader (and writer) of poetry in the interim. I suspect that reason is that reading and understanding proofs requires attention on several levels: the immediate one of the specific assertions and the steps which lead from one to the next; the next level up, which is the overall "shape" of the proof (what it looks like in outline); and finally, the place of the proven result in the branch of mathematics under consideration. There is a keen esthetic pleasure in seeing a theorem in the light of all of these three considerations more or less simultaneously. Among the literati, it is not considered a compliment to compare a literary work to a mathematical result, but there are several novels and poems which give me the same sort of satisfaction: things that "work" on several different levels at once. I am not exaggerating when I say that it is the study of mathematics that gave me real appreciation for good literature, where I mean "good literature" in this sense of complexity and multiple levels of meaning.

There is yet another sense in which scientists do not qualify as intellectuals (according to the authorities): we are not assumed to concern ourself with politics, and when we do, it comes as an incredible surprise to everybody. Of course, I am not talking so much about actualities as about popular conceptions; right off hand, I can reel off several names: Oppenheimer (who got in trouble for it), Teller, Sagan, Chomsky, . . . If foreign entries are permissible, we can add Sakharov and Z. Medvedev (a geneticist whose book on Lysenko I review later in this zine). Of course, both of my foreign examples are Russians, and this is somewhat unfair because here we are talking about another, quite different tradition of intellectuals. It is from the Russian that we have the term *intelligentsia*, and the Russian *intelligent* (intellectual) is a different sort of creature from his American cousin. In the nineteenth century, the czars (particularly Nicholas I) considered the study of philosophy to be extremely dangerous and did everything possible to prevent young Russians from studying the incorrect thoughts of such lowlifes as Hegel and Kant, at least at Russian universities. Physics and mathematics, on the other hand, had no overt political content, although the young revolutionaries of the time took the physical sciences as their model for clear thinking. Many of the Russian empire's most subversive elements were educated in the sciences. Dostoevsky, for example, went to engineering school. Peter Lavrov, whose *Historical Letters* inspired the Narodniki (populists) of the eighteen-seventies, was a mathematician. Sonia Kovalevskaya, the first European woman to hold a professorship in mathematics, wrote novels that were favorably received, and gave material assistance to many friends who were involved in revolutionary activity abroad. Americans who are astonished at Sakharov, for example, expressing opinions on international politics and domestic policy, do not realize that he is acting within an intellectual tradition, one that does not recognize a dividing line between clear thought in the sciences and clear thought in political discourse.

To the degree that we think out the consequences of our (and others') research, to the extent that we debate the merits of applications of existing science (SDI is a good example), insofar as we look beyond our immediate interests (material and intellectual), I think that we qualify for membership in the American *intelligentsia.* In fact, I shall go yet further in my heresy and claim that it does not matter what one may claim as profession or livelihood; *anybody* who thinks critically on questions of concern to the world (we'll argue about what those are later) and joins in public debate is fulfilling the duties of the intellectual.

If this exposition doesn't satisfy, I propose an *Operational Definition*: Intellectuals are the first people they shoot come the revolution/palace coup/shift in Political Climate. If they think you're smart enough to be shot, you qualify.

Bad science versus psuedoscience: a personal essay

Martin Gardner. Fads and Fallacies in the Name of Science. Dover, New York, 1957.

Stephen Jay Gould. The Mismeasure of Man. Norton, 1982(?).

First, if you haven't read either of the above books, go forth into the world (or the local public library), seize copies thereof, and devour them. I highly recommend both of them. They served as the taking-off point for the ruminations which follow.

The Mismeasure of Man, which I read first, is an historical and methodological survey of the misuse of science, particularly biology and psychology, for covertly political ends. Gould ignores such borderline phenomena as the Nazi "science" of race or the ideologically pure "Soviet genetics" promulgated by Lysenko, and confines his investigations to subtle misuse of the methods and results of mainstream science. His survey begins with the nineteenth-century anatomists who measured the volume of the skull in order to prove theories about the comparative intellectual powers of the various human races. Gould himself reproduced many of the experiments done by Paul Broca and others, and uncovered evidence of serious data-fudging. He also discusses theories which sought to link a "criminal nature" to certain supposedly atavistic body features, such as a pronounced ("Neanderthal") brow; apparently these theories had a profound influence on modern jurisprudence, especially in the matter of variable sentences for the same crime (on the idea that it was *not* the same crime if committed by a true "criminal type" on one hand, or an otherwise law-abiding citizen on the other). He also cites examples of blatant racism in nineteenth-century biological and anthropological monographs, including one fairly shocking series of engravings which purports to demonstrate a resemblance between the "lower" (Black and Oriental) human races and the orangutang, chimpanzee, and gorilla.

The nineteenth-century abuses of science turned upon relatively naive manipulation of data (including the discreet disposal of any samples one didn't like). It is the twentieth-century part of the book which frightened me. This mostly treated of the history and development of so-called intelligence testing, and in its later parts included some fairly sophisticated exposition of statistical theory and experimental design. Gould shows how Cyril Burt fabricated his famous (or infamous) studies of twins, which claimed to prove that in the tug-of-war between heredity and environment, heredity was the overmastering factor; on the basis of those studies the British instituted the 11+ exams, which tracked all eleven-year-old children into vocational or college preparatory programs, based on their test scores. (I think of this with a shudder; if I has been so tracked on the basis of my test-taking ability at the age of eleven, I would be working in a factory now.) It was not only the British who showed a fondness for pigeonholing; Gould shows that it was American psychologists and educators who seized Binet's "intelligence test" (which was originally designed to discover *mild to moderately severe retardation*, not to measure innate mental capacity in normal persons) as the ideal pigeonholing tool. There were many "progressive" Americans of the late nineteenth and early twentieth century who advocated the compulsory sterilization of all who proved themselves "feeble-minded" by performing in a "substandard" fashion on such tests.

In summary, Gould's book is a catalogue of the ways in which scientists indulged their (often unconscious) desire to see "self-evident" social theories "scientifically" vindicated. It was precisely the unconscious character of the prejudice, and the tedious work involved in uncovering the dishonest use of experimental data, which so disturbed me. Here we are not considering the fulminations of crackpots but the considered conclusions of respectable scientists; upon the word of such personages are institutions founded, and policies set, which profoundly influence our lives. Consider the American mania for test scores as measure of intelligence; how many of you agonized (or gloated) over your intelligence as revealed by the oracles at the Educational Testing Service? How many school systems judge whether or not they are doing their job according to how well or poorly their pupils perform on the SAT and similar tests?

From bad science we move to pseudoscience, a matter which may be taken more lightly, as it does not transpire within the actual precincts of the temple of science but, as it were, in the public square. Gardner's book presents itself as nothing more or less than a bestiary of pseudoscientific doctrines: the cosmology of Velikovsky, L. Ron Hubbard's Dianetics (which, at the time Gardner wrote, had not yet evolved into Scientology), the UFO cults, which are alive and well in the supermarket tabloids, and the extremely dubious genetic theories of T.D. Lysenko. Except for the chapter on Lysenko, which of necessity requires a more sober tone, the presentation is for the most part fairly lighthearted. Gardner does not really attempt much in the way of causal explanation, beyond amateur psychologizing about the rebellious impulses of pseudoscientific cult leaders.

So Gardner writes of the pseudoscientific theories espoused by scientific illiterates (or semiliterates); Gould exposes the abuses of science by the scientists themselves. The first question that occurred to me was which of the two phenomena is worse: which has a more profound influence on our destinies, as individuals and as a society?

What does the existence of pseudoscientific doctrines say about the place of "real science" in our society, and the effectiveness of our scientific educations? Gardner points out that almost all pseudoscientists attempt to arrogate to themselves the trappings of science: highfalutin jargon, mysterious gadgets with bells and whistles and blinking lights, counterintuitive claims about the way the world works. When it comes to substantiating their claims, none of them tried to bolster their cases with anything remotely resembling controlled experiments; they have no notion of science as *method*, rather than science as *priesthood*.

The appeal of pseudoscience to the poorly educated is clear; everyone wants to feel smart, and the pseudoscientists offer their disciples the illusion of being initiates into the mysteries, mysteries *which are rejected by the Scientific Establishment*. (Nothing like being in on the ground floor of a Great Idea!) I assert that the wide popularity of pseudoscientific doctrines is not surprising, given the quality of the average American education in science. For the most part, I attended parochial schools, not the much-criticized public schools; in spite of the vaunted "high standards" I recall very few instances in which the textbook (let alone the teacher) actually described the experiment or series of experiments which established a given scientific "fact." Rather, it was the "facts" themselves (and the regurgitation of them on command) which had the greater importance. On what authority, for example, were we to accept the extremely counterintuitive idea that the earth circles the sun, and not vice versa? *On the authority of the textbook, and of the teacher who lectured from it.* In practice, *argument from authority* is the method used to teach science at least up to the eighth grade, and quite often into high school as well. Argument from authority is the favorite tactic of the pseudoscientists; how do we offer students any real defense against it?

Let us consider the sobering fact that it is possible to graduate from many American high schools (*and colleges*) without ever having seen one "real" laboratory science (physics, chemistry, biology) course. High schools obligingly offer such fluff as "earth science" (watered-down geology and ecology) and "science for consumers" (chemistry and biology in Real Life, e.g. Why soap cleans); colleges and universities offer courses in "science for non-majors" which are, for the most part, survey courses for time-servers. (I have never learned anything worth remembering in a survey course, especially not in subjects where the *method* is the most important thing you can learn.) Even in real laboratory courses the emphasis lies more on making the experiment "come out right" than on being sure of the soundness of one's method. My friends and I fudged our error analyses in physics lab at the University of Chicago; on the other side of the teacher's desk, I encountered too many freshmen in calculus and pre-calculus courses who only wanted The Answer, and cared not one whit how they got it. (As one who began her mathematical career as an aspiring logician, I found this attitude depressing in the extreme.)

From the educators' point of view, it is far easier to condition students to memorize Facts than it is to teach them to cultivate Method. We leave aside the tempting observation that a citizenry capable of critical thought is a dangerous thing to Those In Charge. Whatever the cause, science education seems to leave the average student quite vulnerable to the claims of pseudoscience, for it gives him or her no method with which to examine bald claims from authority; this is in the ideal case that any of the Facts ingested in the course of this education actually *stick*.

If you are an average product of such an education, it is a good guess that you fall victim to one or another pseudoscientific scam almost daily. On perusing the magazine stand at Dominick's supermarket some months ago, I discovered that there are at least two or three magazines devoted exclusively to the playing of the Illinois State Lottery and similar games; their feature articles seem to be divided between interviews with lottery winners and schemes for making oneself a winner. The latter refer to such dubious notions as "lucky numbers." At work, I overheard my officemate, Bernice, talking with her teenaged daughter about the lottery. The daughter had subscribed to a lottery players' newsletter which consisted entirely of long lists of numbers *which hadn't been drawn yet*. Anyone with even the barest acquaintance with probability theory will realize that the selection of winning lottery numbers is like a coin toss in that each number is an independent event. Theoretically, the same number *could* come up twice. Please note that what *I* know of probability theory was gleaned from a very bad course in Probability and Statistics for Business Majors; I am a mere hairsbreadth from complete illiteracy in the subject myself.

Further evidence. The next time you are in the supermarket, pick up any of the usual tabloids (the *Weekly World News* is a good one); skip the articles (amusing though they be) and look at the advertisements. Here you have a true measure of "what the market will bear" in the way of outrageous claims. In these pages you will find descriptions of magic charms and amulets to protect you from evil spirits, give you wealth, prosperity, and power over your enemies, and secure for you the adoration of whomever you may desire. I am certain that people do buy these things; the advertisers must count on a certain percentage of the readership being sufficiently tempted by these promises to buy the goods offered for sale. Rather frightening, is it not, to think that a good segment of our population is living in the Middle Ages. I remember first seeing the tabloids, when I was twelve or so, and feeling great outrage at their publishers getting away with Telling Lies in public; in college, lots of my friends and acquaintances found them vastly amusing (a copy of the "Human Head Transplant!" story from the *Weekly World News* was posted in a place of honor on the Department of Neurology bulletin board at the University of Chicago Hospital for many months.) I think I have come full circle to finding them disturbing, chiefly because they seem to find such a huge and apparently credulous audience.

Pseudoscience seems to me less a cause of scientific illiteracy (and its concomitant disorders) than a symptom; specifically, the degree to which pseudoscientific ideas go unchallenged indicates the degree to which our educational system fails to teach scientific method in particular and critical thinking in general. Bad science, on the other hand, has far more influence, because its practitioners command far more respect from those who actually make educational, legal and social policy. Gould has enumerated plenty of large scale examples of this.

There is one more way in which bad science is dangerous. In the mind of the "educated public," it bears the imprimatur of scientific authority, the cachet of truth itself. It is very hard to oppose one's own desires to pronouncements which carry such authority. When I was in grammar school and high school, much was made of various educational studies which purported to "prove" that mathematical talent was an exclusively male attribute. Most of these studies were based upon scores on standardized "intelligence tests" and did not recognize, let alone attempt to eliminate, the influence of social biases. The important point, however, is that the *methodology* of the investigators was never discussed, only their "results." The impression I was given by my teachers was that this was just Nature, not a damned thing I or anybody else could do about it--and furthermore if I did try to defy the dictum of nature, I'd just make a fool of myself. Unhappily, I did not stop believing this stuff until well into college--in fact, well into my training in mathematics. Once every few months I would have a moment of horrifying vertigo when I realized *I was doing that which They said was impossible.* I felt very much like one of those cartoon critters that walks *x* many yards out onto thin air, until it realizes what it's doing, whereupon it plummets into the abyss. I suspect a similar mechanism is at work in the severe test anxiety of several (female) mathematician friends of mine.

One answer to this problem is good science education, but this (naively, perhaps) assumes the sort of basic foundation whose lack provides the pseudoscientists with such fertile ground. If one doesn't even have the intellectual tools with which to distinguish science from not-science, one certainly is in no position to examine the methods of members of the scientific Establishment.

In search of politically correct science:

The career of T. D. Lysenko

Zhores A. Medvedev. **The Rise and Fall of T. D. Lysenko.** Translated from the Russian by I. Michael Lerner. Anchor Books (Doubleday & Co., Inc.), Garden City, New York, 1971.

"Seldom before in the history of modern science has a crackpot achieved the eminence, adulation, and power achieved by Trofim D. Lysenko, the Soviet Union's leading authority on evolution and heredity. Not only have his opinions been pronounced dogma by the Kremlin, but his Russian opponents (whose views are held everywhere but in the USSR) in recent years have been systematically eliminated from their posts. Some have died in prison camps. Some have simply vanished. A few remain at work--but it is work in other fields of biology."

With these words, Martin Gardner opens his chapter on "Lysenkoism" in *Fads and Fallacies in the Name of Science*, reviewed above. Gardner wrote this as an American scientific journalist in the mid 1950s; even if we did not know this, it would become amply clear in a few pages. He is incredulous that *such things happen in the modern world*. His vantage point is not without its merits, chief among them being the clarity supposedly vouchsafed to outsiders looking in. However, for most of us, it is a very familiar point of view. We in GT are (almost) all Americans, we pride ourselves on our scientific culture; in some more or less well-defined sense, we consider ourselves "progressive", "modern", and "civilized."

Zhores Medvedev's book offers a slightly different view of the Soviet scientific establishment and of Lysenko's manipulation of its institutions for his own ends. Medvedev is a biologist, specifically a geneticist; as such, he was himself involved in the struggle to oust Lysenko and his followers during the late fifties and early sixties. Furthermore, although he now lives in the West, he acted as an insider, a member of the "loyal opposition." In his book, he does not repudiate Marxist socialism as a basis for a reasonable society; he does, however, decry its perversion into theology by political opportunists. He thinks of Stalinism (or "the cult of personality", as it is called in the USSR) as an aberration in an otherwise healthy system.

This book was circulated in manuscript during the last decade of Lysenko's reign; Medvedev explains that it began life as an historical and polemical sketch, and only became a real history after Lysenko's fall, when the concluding chapter was appended.

Although much of the book is devoted to description of the tactics by which Lysenko attained his position of influence, I would do well to cite a few of the atrocities against science of which Lysenko was guilty. (We leave aside the "merely political" matter of his having his opponents arrested.) Medvedev carefully explains that it takes ten or more years to develop a new variety of wheat; Lysenko promised to deliver new varieties in two to three years. Agricultural scientists who opposed this as rash and unrealistic were accused of unpatriotic and sinister motives. At one point, it was proposed that the soil could be improved by plowing it to a depth of *two meters*, which turns up the infertile clay strata that underly the topsoil. (I was particularly shocked at this because, ignorant as I am of agricultural methods, I knew it to be a Bad Idea just from my own brief flirtations with backyard gardening). Several of Lysenko's followers published papers claiming to have transformed one species into another (rye into wheat, for example), or inorganic matter into living cells. Not only was all of this acutely embarrassing to any self-respecting Soviet scientist, but because it all took place in the vital area of agricultural biology, it had profound effects on the agricultural development of the Soviet Union. Consider that Lysenko was not ousted from his position of influence until 1964, and keep in mind the ten-year timetable Medvedev cites for the development of new plant varieties--and note that Lysenko was instrumental in diverting money and prestige not only from real research in plant breeding but in livestock breeding as well--and you have at least one or two clues as to why American farmers have been able to sell the Soviets such large quantities of wheat.

Lysenko rose to power during the thirties. This rise was not the result of conventional academic power plays, or of a distinguished record of publication. In several senses, Lysenko and his followers moved *outside* the institutions of Soviet science (the Academy of Sciences and the Lenin All-Union Academy of Agricultural Sciences) in pressing their case. Lysenko rejected conventional Mendelian genetics and adopted a Lamarckian view instead, not on scientific but on ideological grounds. He claimed that Mendel's discoveries about the mechanisms of heredity were inconsistent with Marx's views on the mutability of individuals and societies. In this sense, the idea that environmentally induced changes were passed on to the next generation was more "correct."

From the beginning, Lysenko and his opponents were speaking at cross purposes. Lysenko denounced all opposition to his views as "wrecking" (sabotage) in the scientific sphere. For example, he criticized the botanist Vavilov for assembling a collection of seeds of food plants from all over the world, on the grounds that Vavilov was spending the people's money to acquire plants that were descended from Russian varieties (never mind that breeding had altered them).

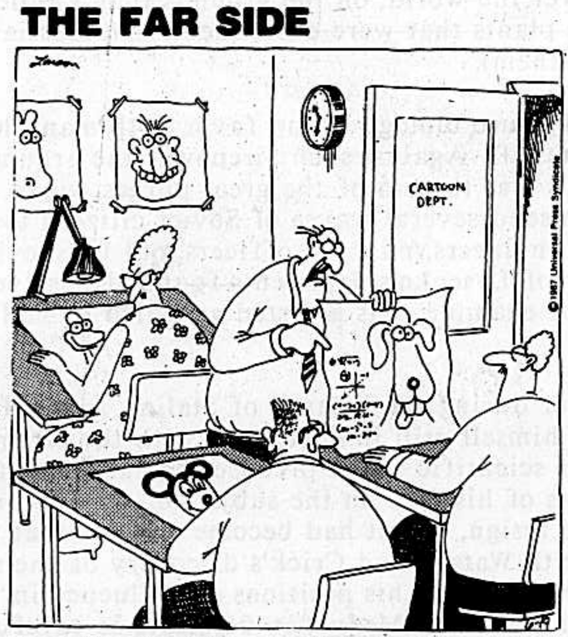
The notion of ideologically pure biology found favor with many high officials in the Party, including Stalin himself. Against such firepower the arguments of scientific method availed nothing. It was the era of the great purges, when the mere specter of sabotage was sufficient to send several waves of Soviet citizens to the firing squad or into the Gulag: peasants, engineers, military officers, old Bolsheviks, ordinary Party members. A good number of Lysenko's opponents found themselves joining the ranks of the purge victims; Vavilov, for example, was arrested and died of malnutrition while in prison.

Lysenko remained in power during the balance of Stalin's rule; when Stalin was succeeded by Khrushchev, he found himself still in good odor with the Kremlin, for Khrushchev was just as ignorant of matters scientific as his predecessor had been, and on top of this had a few crackpot notions of his own on the subject of agriculture. It was not until Khrushchev was forced to resign, and it had become obvious that molecular genetics was the wave of the future (with Watson and Crick's discovery of the structure of DNA) that Lysenko was finally forced to resign his positions of influence in the Academy of Sciences and other scientific bodies. Medvedev describes in careful and interesting detail the ebb and flow of opposition that culminated in this ouster, and provides sketches of the principal personalities on both sides. In the final analysis, Lysenko and his cohorts emerge as crass opportunists, loyal neither to science nor to ideology nor to country, but using appeals to all of these to advance their own positions.

It's now time for a chorus of "But it can't happen here!" At first glance, I would agree: no, it's not very likely that a crackpot could seize the American scientific establishment *from above*, as Lysenko did in the Soviet Union. Our scientific institutions are less centralized, and our national ideology far less codified, than those of the USSR. However, I do argue that there is some similarity between the followers of Lysenko and our own home-grown Creationists: both seek a science that is more in harmony with cherished and rigidly held views of the world. Lysenko worked from above; the creationists work from below. Witness the many grass-roots organizations devoted to the monitoring of science textbooks, the relentless battle through the courts to establish the creationist view as a legitimate scientific view to be taught as such in the schools. I have read that a number of textbook publishers have watered down their books in response to this pressure. As previously noted, American scientific education has enough problems as it is; we don't need politics on top of everything else.

An incredible dearth of mailing comments

Not because I had nothing to say to anybody, but because I ran out of time. Honest, really, next time I will try to catch up; they may be a tad stale by then (but what in this universe stays fresh for long?) Meanwhile, O noble readers, I crave your indulgence.



"Hey! What's this, Higgins? Physics equations? ... Do you enjoy your job here as a cartoonist, Higgins?"

(Does anybody know this fellow?)